This Issue: Advance Papers Del Monte Convention, Pacific Coast Section, N.E.L.A.

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JOURNAL OF ELECTRICITY

VOL. 40 NO. 8 SAN FRANCISCO, APRIL 15, 1918 PER COPY, 25 CENTS

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April 15, 1918

To the members of
Pacific Coast Section,
N. E. L. A.--

The Sierra & San Francisco Power Company and The Coast Valleys Power Company welcome you to their home.

May the beauties of the productive territory served by our power lines prove of such charm that your helpful presence will be with us on many future occasions.

Sincerely,
H. F. JACKSON,
Pres. & Genl. Mgr.

JOURNAL OF ELECTRICITY

FOUNDED 1887

ROBERT SIBLEY, Editor — CLOTILDE GRUNSKY, Associate

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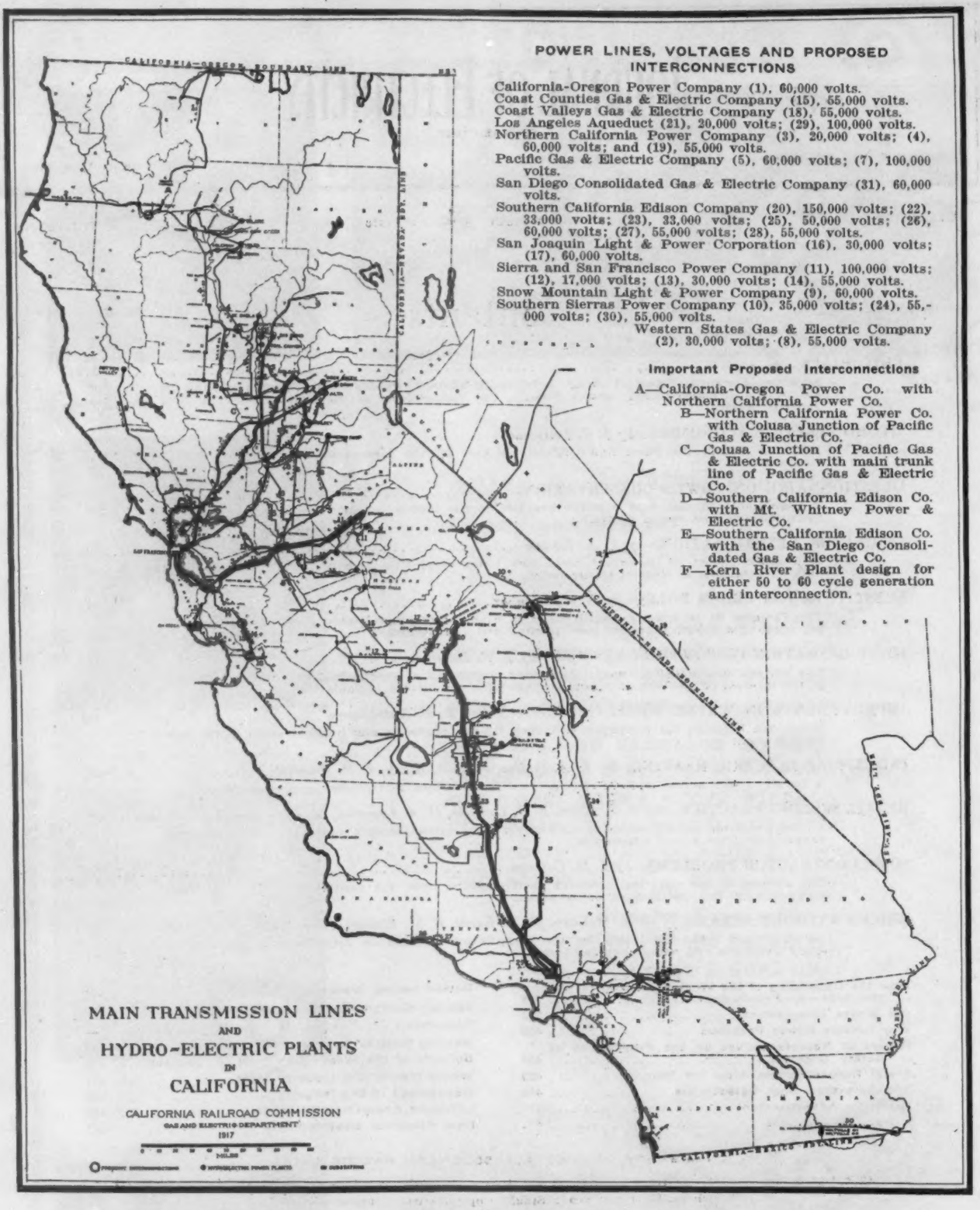
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Coast Counties Gas & Electric Company (15), 55,000 volts.
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F—Kern River Plant design for either 50 to 60 cycle generation and interconnection.
CALIFORNIA-OREGON BOUNDARY LINE
CALIFORNIA-NEVADA BOUNDARY LINE
MAIN TRANSMISSION LINES
AND
HYDRO-ELECTRIC PLANTS
IN
CALIFORNIA
CALIFORNIA RAILROAD COMMISSION
GAS AND ELECTRIC DEPARTMENT
1917

How the Upbuilding of the West is Helping to Win the War—X

HERE is exhibited a district served by the greatest hydro-electric companies in the world. This particular district produced almost a billion dollars in agricultural wealth and in excess of a billion dollars in manufactures during 1917 — an increase of 50 per cent over the previous year. Agricultural and industrial life in the West are so interlinked with electric power supply that any effort looking toward increasing the efficiency of its vast networks of hydro-electric power may well be classed as war service of the first order.

APR 22 1918 ©CLB412136

JOURNAL OF ELECTRICITY

DEVOTED TO THE UPBUILDING OF THE ELECTRICAL INDUSTRY IN THE WEST AND IN THE COUNTRIES BORDERING THE GREAT PACIFIC

Volume 40 SAN FRANCISCO, APRIL 15, 1918 Number 8

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LOOKING forward confidently to the time when the bitterness of business competition shall give place to co-operation, we stand firmly for the principles of the United States in this war. For the cause is the same. It is this spirit which is leading us to more constructive ideals in business, because the success of each individual is dependent on the well-being of the whole industry, which is leading us as well to the doing away of national jealousies in recognition of the fact that we rise or fall with humanity's cause. This, without reservation, we support—

BUY A LIBERTY BOND

Effectual War Service

The great gathering at Del Monte, May 9-11, 1918, which ushers in the second annual convention of the Pacific Coast Section, N. E. L. A., will undoubtedly prove the most effectual war service gathering among men of the electrical industry in the West thus far convened.

Throughout its sessions the keynote of war service to the nation will be sounded on every side. The engineering papers dealing largely with questions of increased power production and more efficient generation, are all in accord with this single thought.

The commercial papers, too, sound forth the same patriotic theme. Every saving in effort that may be brought about by a truer spirit of co-operation is emphasized to the utmost, and earnest plans are being formulated as to how this may the best be brought about in harmony with the stress of national emergency now upon us.

Even the women's sessions are to flavor of this same ideal of higher and truer service to the nation. Unique in the sessions of the N. E. L. A. will be the women's war service meeting on the evening of Thursday, May 9, 1918, to which the men are invited, and at which time no other session of the convention will be held. This meeting, in charge of the women of the convention, is planned to feature how women, now such a growing factor of importance in business affairs, may the better render service both to our industry and to the nation at large. At the same time ideals of war service in the home, and how electricity may the better play its part of war service to the nation, will be forcefully brought out.

In serious times such as these no greater demand ever existed for such an all comprehensive gathering as that planned for the four branches of the electrical industry — the manufacturer, the jobber, the central station man, and the contractor-dealer — at the Del Monte convention.

Every reasonable effort is being made to obviate conflicting calls upon utility men during the convention week. Even the hearings of the California Railroad Commission are placed so that utility cases will not be set in conflict. Utility managers are urged to do all within their power to attend this convention in person and to see to it that as many of their men attend as can reasonably do so.

This is the one great expressive meeting of the year in our industry, and you cannot afford to miss it.

An honor flag means a record worth advertising—

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Ill-advised Publicity

The Journal of Electricity has for over thirty years been an effective medium by means of which a point of contact has been maintained between the throbbing, pulsating activities of the West and the industrial and commercial life in the East.

Through this long period of time, it has been a matter of annual gratification on the part of its publishers to hear the beautiful words of praise expressed by Eastern men to representatives of the Journal of Electricity, commending the splendid agricultural, industrial and commercial strides that are visible on all sides in the West.

There has, however, come to the ears of the representatives of the Journal of Electricity, in recent months, an accusation against the West that Chambers of Commerce and other public spirited bodies of the West will do well to heed and to take measures to prevent the possibility of such accusations in the future having a foundation in fact.

The West has been unusually free from many of the inconveniences that have been brought on by the present national crisis. Since the source of our power supply is in so great a measure derived from water

power development, the dimming of lights has not been found necessary. Also, due to the beautiful climatic conditions that prevail in this section, little personal privation has been felt from shortage of fuel. And our agricultural production, amounting as it did to a vast increase in the past year, has made ample provision for food and clothing and other bodily wants.

But to allow an organized scheme of propaganda to proceed, emanating from the West, as has occurred during the past season, in an attempt so to parade these facts before the mental vision of the East is not only unwise from the standpoint of public policy, but in view of the national crisis leaves us open to well-merited criticism.

This nation is now welded together in an indissoluble chain of mutual helpfulness in the bending of every effort to meet the world crisis that is upon us. And that propaganda which attempts to forward favored sections over against less favored sections, due to present stress in national affairs, should be condemned.

A Possible Saving of 400,000 Kw.

Daylight saving means much to us all. The present law which caused all clocks to be turned ahead one hour the last Sunday in March, is perhaps the most remarkable accomplishment — a bloodless victory, as it were—in economic saving that has been instituted in the industrial and domestic life of America.

At first sight the law is commended simply upon its face value as a quick and effective means of starting the labor each day one hour earlier, agreeable to the old adage of "early to bed, early to rise, makes a man healthy, wealthy and wise." But upon careful analysis it is seen to have a far deeper, fuller significance.

Although the new ruling will directly affect the electrical industry to the extent of a loss in revenue amounting to the vast total of some nine million dollars annually, with the saving of only some 300,000 tons of coal representing say $900,000, still broad-minded electrical power men can not help but weigh the matter from the viewpoint of the vast resulting of good to the economic life of the nation and as a consequence they rejoice in being able to help contribute to the general good in this effective manner.

The one vulnerable and defective point in the new law is, however, found in the fact that the law is operative but seven months of the year. A nation-wide educative campaign should be inaugurated at once to correct this glaring defect, which in so many respects kills the good effect of the present law.

An analysis of the power charts of central stations of the nation shows that by continuing the daylight saving throughout the year, the winter months would net a rather remarkable industrial saving of power, so extremely necessary in the heavy industrial strain now thrown upon the great electric generating companies.

In this analysis it is found by this extension of the daylight saving enactment that the day power load and the evening lighting load would not continue to overlap during the winter months as at present. The lessening of the peak load for central stations throughout the nation would as a consequence liberate 400,000 kw. of electrical energy, as brought out by Samuel Insull, president of the Commonwealth Edison Company of Chicago and chairman of the State Council of Defense for the great state of Illinois, in his rece t address before the San Francisco Electrical Development League.

This liberation of 400,000 kw. of installed capacity would mean a tremendous industrial asset. Not only would it release from 150 to 200 millions of dollars in invested capital, but this power could be sold for absolutely necessary industrial activities, and thus bring a two-fold blessing without in any way imposing an unjust burden on anyone. The only possible penalization would be that caused by keeping the clocks ahead as now operating throughout the nation, if indeed this getting-up-early habit can in any sense be called a penalization.

The electrical industry engaged in the supplying of power, now represents an invested capital of nearly three billion dollars. But the important fact to bear in mind is that electric power is an indispensable part of our industrial life. Surely our legislators will not overlook this splendid possibility of bettering the industrial activity which means so much to us all at this critical period.

Really, now, how great is the service you are giving?
BUY A LIBERTY BOND

Distinguished Service Orders

Thoughtful men see in each day's work on the part of every American citizen a possibility for service just as laudable and just as effective at home as he who serves in the trenches. In a word, it is not so much what you do, but how you do it, that makes for the ultimate good in human endeavor.

The increasing necessity of bringing out utility service in power generation to its maximum efficiency calls forth the wisdom of central stations inaugurating "distinguished service orders" for properly rewarding the men and women in the service of the company who are assisting in this timely work so helpful to the efficiency of the nation as a whole in the present trying period of national life.

Perhaps an illustration may serve better to point out the fuller meaning of the "distinguished service order." The conservation of fuel oil on the Southern Pacific lines is regarded as of such importance that locomotive crews on every division are bending their energies toward getting out a maximum of good from the fuel consumed. Under recent orders, each class which makes the best showing on its respective division in the matter of fuel oil saving, will now be decorated the same as a hero on the Western front. The decoration takes the form of a bright red insignia on the circular plate which fronts the boiler of the locomotive.

In the operation of power plants, both steam and electric, and indeed in many other departments of utility life, the thoughtful attention of the operators, viewing each daily task from a new angle, namely, that the task in hand is a link in the great chain of effort that is helping to win the war, will do wonders in working out increased efficiencies and in conservation of material and labor.

The whole matter is one well worth the serious study of all men who have a part in directing the generation of electrical energy, and the conclusion is bound to follow after thoughtful consideration, that much good may be expected to follow any well-worked-out scheme for the inaugurating of a "distinguished service order."

The Catastrophe at Calaveras

The recent failure of the great Calaveras dam, some thirty-six miles southeast of San Francisco, does not in itself condemn the type of dam used in the design, but it does emphatically point to the necessity of more caution in the construction method employed.

Since the crest of the dirt dam that has been under way in construction for some years past is designed to tower to a height of 240 feet, thus breaking the world's record for dams of this particular type, its construction has been watched with unusual interest the country over.

In view of the wide interest that this catastrophe has attracted throughout the engineering world, a brief resume of the historical features of the work is timely. As early as 1875 plans for the construction of the Calaveras dam have been proposed and extensive explorations have from time to time been made to determine the proper location, and character and depth of bedrock.

This reservoir site, one of the largest in the West, is the largest storage reservoir in the Alameda system of the Spring Valley Water Company, which furnishes San Francisco with its domestic supply of water.

In the Calaveras Valley nature has provided a huge bowl three miles long and one mile wide, with a deep and narrow outlet at its northeasterly corner. The bowl offers a splendid opportunity to form a large lake, while the narrow outlet affords an admirable dam site whereby the lake may be readily formed.

The watershed of the catchment area directly tributary to the Calaveras Reservoir covers an area of 98.3 square miles, with possibilities of diverting into it certain of the waters of upper Alameda Creek, thus creating a total drainage of 133 square miles.

The dam had reached a height of nearly 200 feet in its construction. The slope of the material on its up-stream side is 3 to 1, and that of the down-stream side 2½ to 1. The top width of the dam is designed to be 25 feet and 1300 feet across.

In its construction, dry clay, sand and gravel were taken from the western side of the canyon and dumped on the upper and lower faces of the dam, so that the width of dry material from the up-stream side to the center was about one-third this distance, while on the down-stream side it was one-half the distance from edge to center. The remaining portion was hydraulicked in from the surrounding hills. This material consisted of about 50 per cent clay and 50 per cent sand and gravel. The coarse material was crushed before passing it into the conveyance pipe.

Since the hydraulicked material was dumped on the rims of the puddle pool, the sand and gravel were thus largely deposited against the dry embankment, while the clay worked its way toward the center of the pool.

In the Journal of Electricity for February 15, 1917, appeared an article on the Calaveras dam by a representative of the Journal who visited the structure during that time in company with a noted civil engineer from the Middle West, who had had years of experience in work of this nature.

Attention was called in the article referred to that while the puddle pool was only four feet deep, still a rod could be easily run down forty feet through the soft clay. The soft condition of the core and its apparent inability to harden was at that time thought by the visiting engineer to be a most troublesome and perhaps dangerous factor in the final completion of the work, due to the hydraulic pressure of the unhardened core exerting itself against the upper and lower edges of the dam.

On Sunday morning, March 24, 1918, the up-stream front of the dam slid forward, carrying away the outlet tower and perhaps causing a total loss in structure thus far completed. There are about two billion gallons of water now in the dam, although, when eventually completed, it is to hold sixty billion gallons. No water escaped, due to the gates remaining intact.

As to how the problem will be further handled remains a question of speculation for the future, but it is self-evident that the existence of the peculiar clay formation used as the core should sound a caution for future designs of this sort, and call for a design that would give greater stability in the solid portion of the embankment.

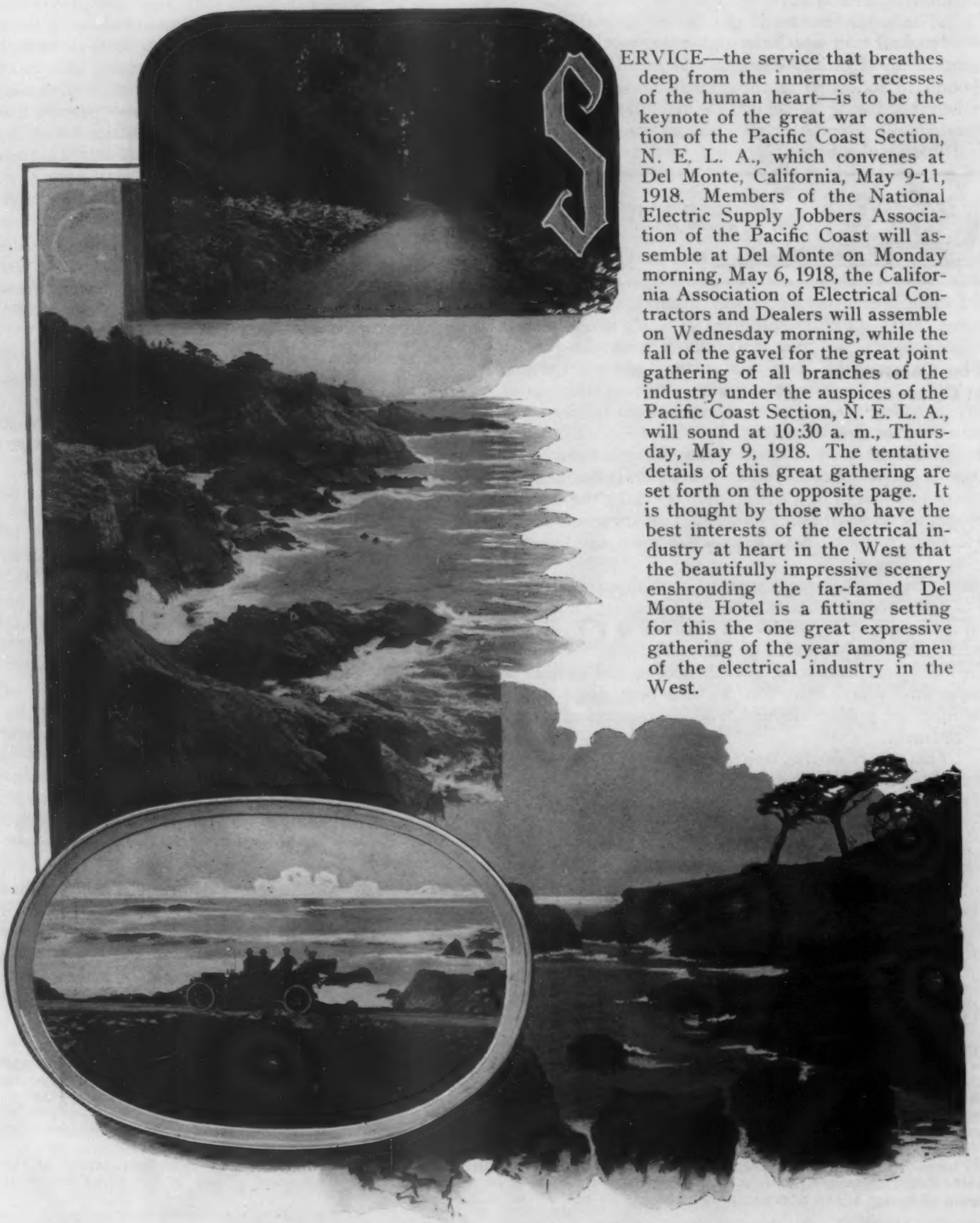
THE NEW JOURNAL SERVICE: The Journal of Electricity, ever alert to be the foremost in forwarding the latest and most helpful ideas in the upbuilding of the electrical industry in the West, will devote the entire issue of May 1, 1918, to the problems of the electrical-contractor dealer, with especial emphasis upon timely pointers as to how the "Goodwin Plan" of the National Association of Electrical Contractors and Dealers and the California Electrical Co-operative Campaign can be made of maximum helpfulness at the present time. No up-to-date man in the industry—central station man, manufacturer, jobber or contractor-dealer—can afford to be without the message this number will contain.

The issue of the Journal of Electricity for May 15, 1918, will contain the official discussions of the excellent papers of the Pacific Coast Section, N. E. L. A. This journal will be the first to publish this information of any of the great electrical papers in America, and thus again demonstrate its usefulness to the nation.

But the first, last and always foremost "New Journal Service" is unflinching service to the nation. To this end we urge all our readers to BUY A LIBERTY BOND

Why not do more than your bit—BUY A LIBERTY BOND

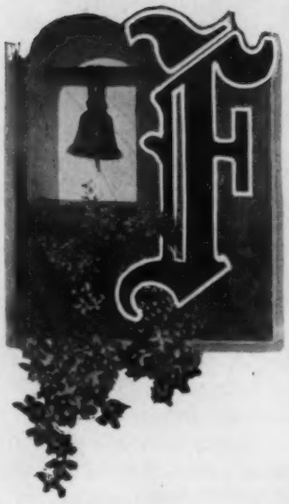
THE DEL MONTE CONVENTIONS



SERVICE—the service that breathes deep from the innermost recesses of the human heart—is to be the keynote of the great war convention of the Pacific Coast Section, N. E. L. A., which convenes at Del Monte, California, May 9-11, 1918. Members of the National Electric Supply Jobbers Association of the Pacific Coast will assemble at Del Monte on Monday morning, May 6, 1918, the California Association of Electrical Contractors and Dealers will assemble on Wednesday morning, while the fall of the gavel for the great joint gathering of all branches of the industry under the auspices of the Pacific Coast Section, N. E. L. A., will sound at 10:30 a. m., Thursday, May 9, 1918. The tentative details of this great gathering are set forth on the opposite page. It is thought by those who have the best interests of the electrical industry at heart in the West that the beautifully impressive scenery enshrouding the far-famed Del Monte Hotel is a fitting setting for this the one great expressive gathering of the year among men of the electrical industry in the West.

C(ash) = E(verybody) / R Don't offer too much resistance — BUY A LIBERTY BOND

CONVENTION DETAILS



FACTS concerning the forthcoming convention have been given wide publicity in former issues of the Journal of Electricity.

In order that the business of this convention might progress with the least confusion possible, and thus make a fitting setting for the attaining of the high war service ideals that are in the planning for it, all the details of the convention are being worked out with unusual care. In the issue of the Journal of Electricity for March 15, 1918, on page 308, was set forth a complete resume of the papers to be presented and full details of the duties of those who have the convention in charge.

There has been mailed to each member of the association full instructions concerning the purchase of tickets, the reservation of hotel accommodations, and other matters connected with hotel and transportation. Should any one desire further information, the inquiry should be sent to W. M. Deming, master of transportation, care Journal of Electricity, San Francisco, or to E. R. Northmore, assistant master of transportation, care Los Angeles Gas & Electric Corporation, Los Angeles. For other information concerning convention details, address inquiry to Robert Sibley, general chairman, care Journal of Electricity, San Francisco.

The expense connected with attendance at the convention may be summarized by saying that a general registration charge of $5.00 will be made for each man at the convention and $2.50 for each lady guest. This charge will include a ticket to the banquet and participation in all the extensive entertainments, including the seventeen-mile drive and the visit at the Highlands. Hotel accommodations range from $5.50 to $6.50 per day on the American plan, which includes the cost of all meals. The railroad fare is whole fare going and half fare return. The use of scrip or reduced fare tickets will not entitle the purchaser to half fare returning. Full details of securing railroad certificates and reservations for hotel accommodations are given in the printed instructions sent out by the master of transportation as alluded to above.

All the papers to be presented at the convention appear either in this issue of the Journal of Electricity or the issue of April 1, 1918.

Through the kindly co-operation of convention officials the excellent new matter that will be brought out at the Del Monte gathering will be immediately available for publication. The complete report of convention discussions will appear in the issue of the Journal of Electricity for May 15, 1918.

TENTATIVE PROGRAM, DEL MONTE CONVENTIONS MAY 6-11, 1918

MONDAY, MAY 6, 1918

9:00 a. m.—**National Electric Supply Jobbers Association of the Pacific Coast** assembles.

WEDNESDAY, MAY 8, 1918

9:00 a. m.—**California Association of Electrical Contractors and Dealers** assembles. Members' session and meeting for motor men and motor manufacturers.

2:00 p. m.—**Special cars** for the Del Monte Convention leave San Francisco attached to the southbound train No. 28; arrive Del Monte 5:45 p. m.

8:00 p. m.—**Special cars** for the Del Monte Convention leave Los Angeles attached to the northbound "Lark." Arrive Del Monte Junction 6:38 a. m. Arrive Del Monte 7:15 a. m.

THURSDAY, MAY 9, 1918

7:15 a. m.—**Arrival** of Los Angeles delegates.

8:00 to 10:30 a. m.—Reception of guests and registration at Hotel Del Monte.

10:30 a. m. to 12:00 m.—**Opening Meeting**—Ladies invited.
Convention opened by brief patriotic exercises. President's Address. Reports of Secretary and Treasurer. Report of Membership Committee. Announcements.

12:30 to 2:00 p. m.—**Luncheon Meetings** of Executive Committee and Convention Committee.

2:00 to 5:00 p. m.—**War Service Session of Engineering Section.**
All in attendance at convention are invited.
Report of Engineering Committee on "War Service Power Problems."
Lantern slide lecture on "Possible Water Power Development in California," by F. H. Fowler, electrical engineer for the Forest Service. Discussion of papers on "Possible Power Development," by F. H. Fowler; "Water Resources in Southern California," by H. A. Barre; and "Joint Operation of Power Companies," by J. P. Jollyman.

2:00 to 5:00 p. m.—**Reception for Ladies.**

4:00 to 5:30 p. m.—**Exhibit** of beautiful color photography plates and views by L. P. Lowe of San Francisco. Open to all.

8:00 to 9:30 p. m.—**War Service Session of Ladies of Convention.** All men and women in attendance at convention cordially invited to be present.
Singing of "America" and statement of purpose of the Women's War Service Session by Mrs. H. F. Jackson.
"What Women Can Do to Help Maintain the Public Utility Efficiency," by a woman representative from the Southern California Edison Company.
"How Electricity May Render War Service in the Home," by Mrs. George A. Hughes.
"War Service Problems for Home Solution," by a noted woman speaker to be announced later.
Singing of "Star Spangled Banner," and Adjournment.

FRIDAY, MAY 10, 1918

9:00 a. m. to 12:00 m.—**Engineering Section.** Discussion of "A Questionnaire on Power Conservation," and papers on Power Plant Losses," by R. J. C. Wood; "Improvements in Water Wheel Efficiency," by E. C. Hutchinson; "Hydro-electric Economies," by J. P. Jollyman; "Transmission and Distribution Losses," by R. E. Cunningham; "Iron and Steel Conductors," by R. C. Powell; "Standardization of Pin Type Insulators," by L. M. Klauber and R. E. Cunningham; "Substitute for Cedar Poles," by L. M. Klauber; "Insulator Deterioration," by J. A. Koontz; and discussion of "Report of Representatives on Preparation of Safety Orders."

9:00 a.m. to 12:00 m.—**War Service Problems of the Commercial Section.**

9:00 a. m. to 11:00 a. m.—Report of Commercial Committee on "Better Selling Methods," and report of sub-committee on "Industrial Electric Heating." Discussion of paper on "Retail Selling Practice," illustrated by moving pictures representing approved standard practice.

11:00 to 11:45 a. m.—Discussion of paper on "Some Contractor Problems," by J. M. Carlson.

11:45 a. m. to 12:15 p.m.—**Accounting Section Report.**

12:15 p. m.—**Convention Picture.** Prompt attention by all in attendance at convention is urged.

2:00 to 4:00 p. m.—**War Service Problems of the Commercial Section.**

2:00 to 3:00 p. m.—Paper on "Development of the Community of Interest," by T. E. Bibbins, and its discussion.

3:00 to 4:00 p. m.—Paper on "Bricks Without Straw," by G. B. McLean, and its discussion.

2:30 to 5:00 p. m.—**Auto Ride for Ladies,** including a visit to the beautiful Pebble Beach and the Marine Gardens.

4:00 to 5:00 p. m.—**General Business Session of the Convention.**
Report of the Public Policy Committee, Nominating Committee, Resolutions Committee, and other general business.

7:00 p. m.—**Grand War Service Banquet.**
R. H. Ballard, toastmaster.
Charles Mills Gayley, speaker of the evening.

SATURDAY, MAY 11, 1918

9:00 a. m.—**Unfinished Business.** Committee meetings and any other matters to be disposed of, announcement of which to be made later.

9:30 a. m.—**Assemble for Out-of-door Sports.**
Golfing, Tennis, Swimming.

1:30 to 5:00 p. m.—**Seventeen-mile Drive** and other scenic wonders, by auto, and Tea at the Highlands.

Why economize if not to buy Liberty Bonds?—BUY A LIBERTY BOND

The Spaulding Dam, from which the water is supplied which feeds the Drum power plant and lower down the Halsey and Wise plants

HYDRO-ELECTRIC ECONOMIES

BY J. P. JOLLYMAN

(Seventy-seven per cent efficiency overall is the high record achieved at the Wise power house. The effective system of tests and checks, the practice in regard to replacements and improvements which have made this result possible, are here pointed out by an engineer who had much to do with the actual constructions involved. In view of the fact that the Pacific Gas & Electric Company serves perhaps the largest territory of any single electric distribution system in existence, and that the installation in at least one of the plants mentioned has broken a world's record, makes this analysis of problems one of peculiar interest. The paper is a portion of the Engineering Committee's war service report for the coming Pacific Coast Section, N. E. L. A., convention.—The Editor.)

1. When considering the actual plant efficiency of the several plants of the company, it should be remembered that most of the older plants have been materially altered since originally planned. In some cases new generating units have been added without increasing pipe line capacity, in others additional pipe lines have been installed along with new generating units. These changes have caused a departure from the theoretically desirable distribution of losses in the several elements constituting a plant, and a statement of the over all losses in such plants cannot be used as a guide when planning economies for other plants.

In the more recent plants, which have been constructed substantially as originally designed, the efficiencies of the several elements are more nearly consistent and some illustrations will be given. From an efficiency standpoint, the only elements in a hydro-electric plant over which the engineer has any considerable control are the pipe lines and the water wheels or turbines. The difference in efficiencies of modern generators and transformers is very small.

The following efficiency data must be regarded as approximate and subject to such errors as may be involved in the methods of test indicated:

The use of two prime movers per generator at Drum and at Halsey should be noted as contributing to the range of load over which the plant can be efficiently operated.

The best efficiencies for the impulse wheels as shown by these tests is about 82 per cent and for Francis turbines from 85 per cent to 87 per cent. That these efficiencies are approximately correct has been confirmed by the results of a series of tests on other units on the system. While efficiencies several per cent higher than these have been claimed for impulse wheels and for turbines, it is felt that they will not be obtained except with the very highest class of apparatus installed under favorable conditions.

2. Records are kept of the amount of water supplied all the hydro-electric plants. At Halsey and at Wise the records are furnished by Venturi meters, at all other plants by gage readings in flumes or ditch sections near the head of the pipe lines.

3. We have considered that accurate, continuous records of the amount of water supplied the hydro-electric plants was of sufficient importance to justify the installation of Venturi meters in the pipe lines at Halsey and at Wise, which are our most recent plants.

Approximate Efficiency Data

Plant:	Drum	Halsey	Wise
Head	1,375 ft.	328	519
Length of pipe line	6,282	5,418	8,546
Generating units	2	1	1
Water wheels per unit	2 Impulse	2 Turbine	1 Turbine
Size each water wheel	9,500 hp. max.	9,000 hp. max.	20,000 hp. max.
Generator kw.	12,500	12,500	12,500
Transformers	6	3	3
Kw. each	4,250	4,250	4,250
Efficiency of pipe line	94 % at 25,000 kw.	94 % at 10,000 kw.	94.2% at 12,500 kw.
Efficiency of water wheels	80 % at 8,500 hp. ea.	85 % at 8,500 hp. ea.	86 % at 19,000 hp. ea.
			87 % at 17,000 hp. ea.
	82 % at 6,500 hp. ea.	82 % at 6,500 hp. ea.	85 % at 13,000 hp. ea.
	80 % at 4,000 hp. ea.	73 % at 4,000 hp. ea.	77 % at 8,000 hp. ea.
Efficiency of generators	96.3% at 12,500 kw.	96.3% at 12,500 kw.	96.3% at 12,500 kw.
Efficiency of transformers	98.7% at 4,250 kw.	98.7% at 4,250 kw.	98.7% at 4,250 kw.
Allowed for excitation	0.7% at 25,000 kw.	0.7% at 10,000 kw.	0.7% at 12,500 kw.
Efficiency overall	71.0% at 25,000 kw.	73 % at 10,000 kw.	77 % at 12,500 kw.
	74.0% at 20,000 kw.		

Pipe losses measured by gages.

Water wheel efficiencies based on water quantities measured by volume drawn from forebay at Drum and on Venturi readings at Halsey and Wise.

Generator and transformer efficiencies were taken from factory tests.

The West has already several world's records—add another — BUY A LIBERTY BOND

4. We have no automatic nozzle control on any of our impulse units. Only one unit at a time is used for governing, so the need for automatic control is not very great. We find that a considerable amount of intelligence must be used in judging the amount of surplus water required for governing margin, and have not so far felt that the benefits of an automatic control were sufficient to justify its installation under present circumstances.

All of our high head Francis turbine units are equipped with relief valves which are set to close automatically after having been opened by a rapid closing of the turbine gates.

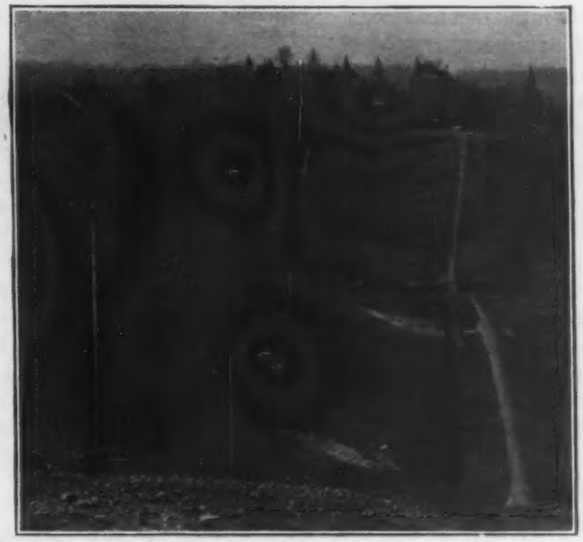
5. We have sufficient forebay capacity to enable us to run at about 80 per cent load factor during flood water and 70 per cent load factor during the period of the use of stored water. With any less forebay capacity we would undoubtedly waste water during the flood water season under the present conditions of load and power supply. The amount of such waste is difficult to estimate accurately, but would be around 200,000 kwh. per day.

6. Just when it pays to renew worn impulse wheel buckets depends largely on whether an improved form of bucket can be substituted for the worn buckets. Improvements in efficiency may be expected from a change in buckets if (a) the form of the original buckets is not very nearly like the best modern types; (b) if the buckets have become pitted or waved; (c) if the buckets have so worn at the entrance as to spill live water; (d) if the buckets have holes worn through them to a material extent.

7. We have secured improvements in the efficiency of several units on our system by replacement of the original equipments with new apparatus of better design. A statement regarding some of these changes may be of value by calling attention to some of the specific defects which were overcome:

(a) In one plant we had several 2000 kw. 240 r. p. m. units originally equipped with double runner impulse wheels 11 ft. 6½ in. pitch circle and 2 ft. apart. The head is 1466 feet.

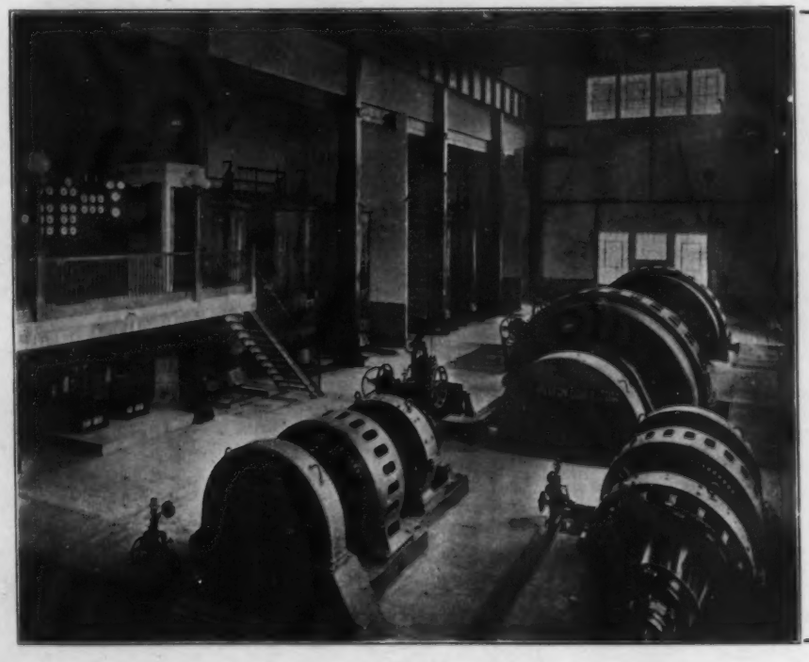
On one of these units worn buckets of good design were replaced by new buckets of the most modern type. The full load output was increased 2½ per cent.



The penstock piping at the Wise power house—over 8000 feet in length. Note the glimpse of the pipe line to be seen in the far distance in the upper left-hand corner. In spite of such immense distances a very high efficiency is maintained.

In this case the old buckets had worn quite smoothly and were of a design which would ordinarily be considered fairly good. Some of the improvement was undoubtedly due to the improved form of bucket.

(b) Examination of these wheels showed that considerable water was striking the backs of the buckets. It appeared that this was most probably



INTERIOR OF THE DRUM POWER HOUSE

Here is shown the interior of the most powerful of the series of hydro-electric plants that comprise the Lake Spaulding Development of the Pacific Gas & Electric Company. The waters of the high Sierras are first stored in Lake Spaulding, and as occasion for their use arises they are then passed successively through the Spaulding, the Drum, the Halsey and the Wise power houses. The system represents one of the largest and most efficient chain of power houses evolved in hydro-electric practice in the West.

Make it a 3,000,000,000 volt shock—slightly warm for the Kaiser—BUY A LIBERTY BOND

caused by the discharge of one wheel striking the backs of the buckets of the other. A baffle was placed between the two runners, resulting in an increased output of 3½ per cent at full load. It should not be inferred that it will always be advantageous to install baffles between the runners of double wheels. In another plant with similar generators, but where the head was 700 feet and the runners 3 feet 6 inches apart, no improvement was obtained with a baffle between the runners.

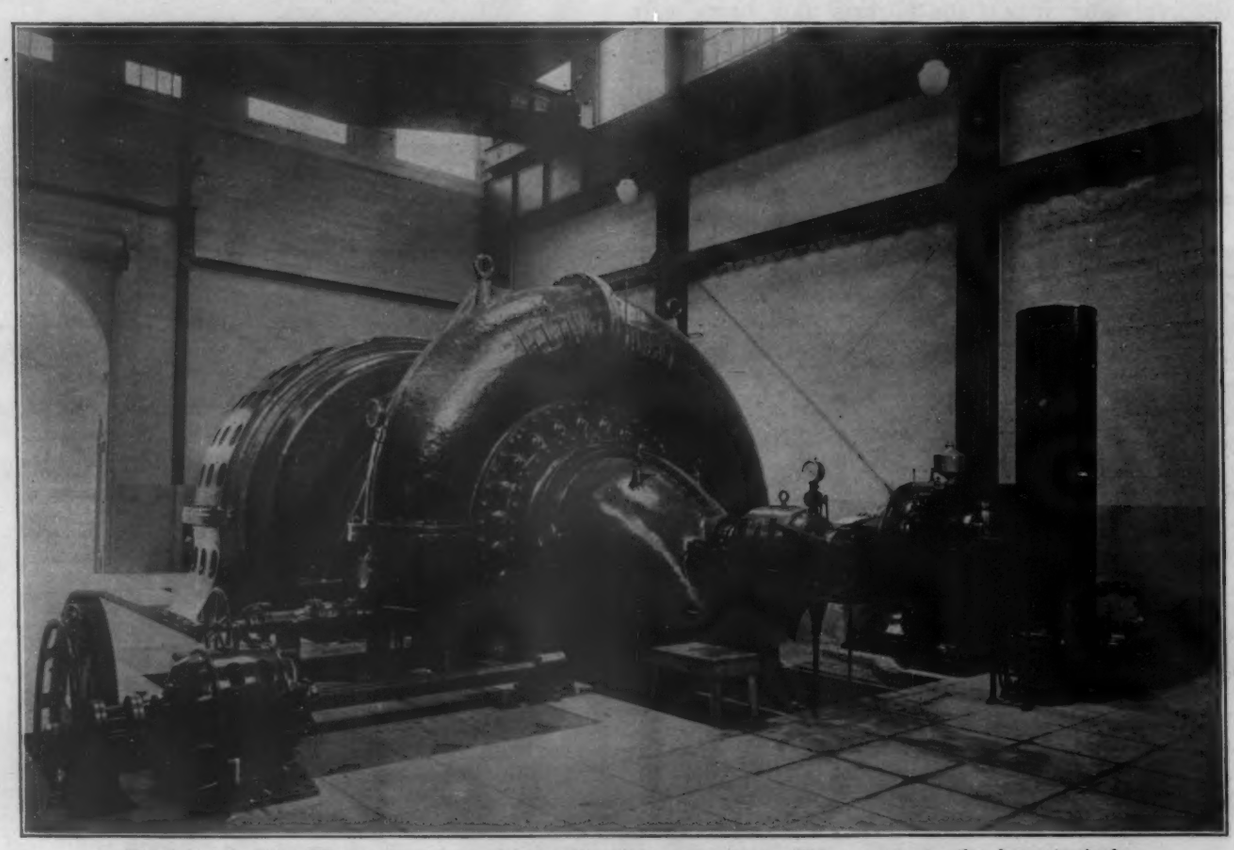
(c) The results of our comparative tests on a number of units in different plants on the system showed that the wheels with specific speed (obtained from the formula $\text{specific speed} = \frac{\text{R. P. M.} \times \sqrt{\text{H. P.}}}{1.25 \text{ Power of Head}}$ which gives higher values for greater ratios of jet to wheel diameter) around 3.5 to 4 gave the best efficiencies. Since the specific speed of the two runner wheels on these units is only 1.02, it appeared there should be an advantage in substituting a single runner for the double runner. This was done with a gain of about 10 per cent at full load, as compared with the original wheels with worn buckets and without the baffles mentioned above.

(d) Due to the progress of the last few years in the design of impulse wheels with single jets for higher specific speeds and in the design of Francis type turbines for lower specific speeds, the range of head-speed-horsepower combinations not covered by these two types has been materially reduced. Since these two types of water motors are much superior to any other types now known, it is sometimes possible to replace an intermediate type such as the Girard turbine with an impulse wheel or a Francis turbine.

We have one plant which was originally equipped with 1000 kw., 400 r. p. m. units, driven by Girard turbines under 660 foot head. These turbines had very poor efficiency and wore out rapidly. The specific speed of this combination is 4.64 and is rather high for an impulse wheel. However, impulse wheels were finally installed in place of the Girard turbines and gave an increased output between 50 per cent and 60 per cent.

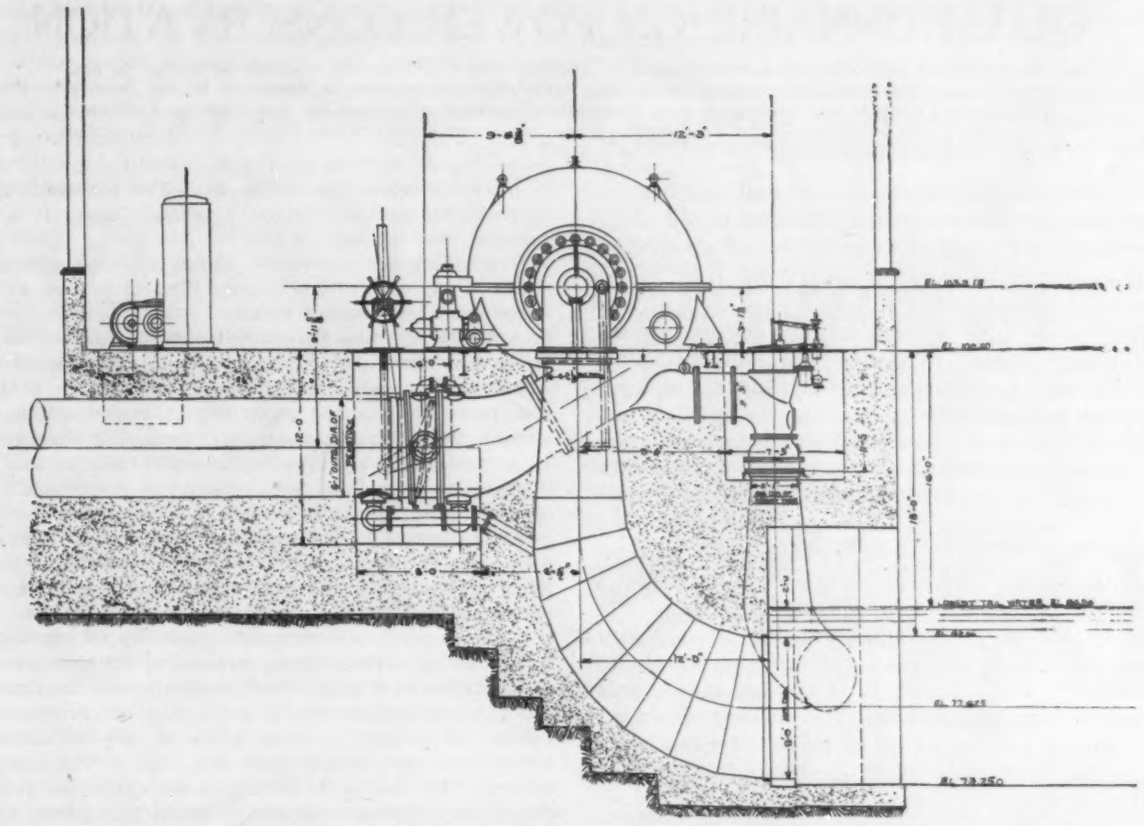
(e) In some cases it may be found that the pitch diameter of impulse wheels may not be correct for the head that is actually used. This condition may arise from an improper design of the wheel, from the use of a lower head than the wheel was planned for, or to a limited extent from a wrong nozzle setting. The correct relative velocity of the pitch diameter of an impulse wheel to the spouting velocity depends somewhat on the specific speed being somewhat less for high specific speeds than for low specific speeds. The range of correct relative velocities probably lies within the limits of 44 per cent to 47 per cent.

We had one case where the original wheels had too small pitch diameters, giving a ratio of bucket velocity to jet velocity of 40 per cent. These wheels



The interior of the Wise power house, showing the giant generators. This represents the largest single discharge unit in existence

Of course you are helping in other ways, but don't forget this need—BUY A LIBERTY BOND



Cross section view of the Halsey plant. The efficiency of the high head Francis turbine shown here is rated at from 85 to 86 per cent

were replaced with new wheels with a velocity ratio of about 45 per cent, and with buckets of improved form. The total improvement in efficiency was several per cent.

We had another case where the wheel replaced had too high a relative velocity, the ratio being a little over 50 per cent. Here, as in the opposite case, a marked improvement was secured with a new wheel of correct velocity ratio and with improved buckets.

In neither of these cases were we able to segregate the improvement due to the correction of relative velocities from the gain due to the superior shape of buckets. We feel that the former undoubtedly contributed to the total result.

In several cases we have secured some gain in output by raising the nozzles slightly above the position recommended by the makers.

Improvement in the efficiency of Francis turbines can be expected from the renewal of badly worn runners or guide vanes. In some cases it may be possible to improve the design slightly if the worn runner shows evidence of faulty design. This evidence is most likely to appear as honeycombing at the points where the flow lines are not just right.

We have replaced worn runners and other parts in some of our Francis turbines, but have not been able to determine what improvements have resulted.

In the foregoing, the improvement of impulse wheel buckets has been mentioned in several cases and the question naturally arises as to what constitutes the best form for such buckets. This is a rather difficult question to answer without undertaking a study of the rather complicated question of the relative motion of the buckets and of the jets of water which pass through them. It is believed that the present models of buckets used by the foremost builders of impulse wheels represent fairly close approximations to the best possible forms, and are distinctly superior to any type that does not quite closely approach them in form.

Under present day conditions some improvements in water wheel efficiencies seem to be the most practical betterments that can be undertaken. The costs are relatively small and reasonably prompt deliveries can be had.

ELECTRICITY FOR WOUNDED SOLDIERS

An electrical apparatus which totally numbs the severest nerve pains, while, at the same time, gradually bringing about a permanent cure, a machine which will cure acute "water on the knee" in one 20-minute "exposure," and another which charges the patient up like a storage battery, are a few of the wonders of the Radcliffe Infirmary for wounded soldiers at Oxford.

The problem of how to exercise electricity on paralyzed muscles without unduly stimulating the healthy ones, has been solved by means of a newly perfected system of condensers, which causes the injured muscles slowly to contract and relax, while the healthy ones remain quiescent.

The only saving which is justified is that which is put to a good cause — BUY A LIBERTY BOND

QUESTIONNAIRE ON POWER CONSERVATION

(A remarkable collection of data in regard to practice with a view to the economy of energy in both hydro-electric and steam generating plants is given here. The information is presented in the form of questions and answers and contains a most comprehensive digest of present day conditions in California. The paper forms a portion of the Engineering Committee's war service report for the Pacific Coast Section, N. E. L. A., convention of May 9-11.—The Editor.)

In order to give the engineers of all member companies an opportunity to benefit from the work of their fellow engineers along the lines of conservation, which all are practicing or working toward this year, the Engineering Committee has collected such data as could be obtained on this subject largely as answers to a questionnaire, and is publishing the same as follows, with the idea of stimulating convention discussion of the points brought up.

In several cases the questions have resulted in such a complete analysis of the situation as a whole with respect to either hydro-electric plants, distribution systems, or steam plants, that the answers forming this analysis have been kept together and presented in the form of a paper constituting a part of the convention proceedings. Examples of this are the papers by Mr. R. J. C. Wood, entitled "Power Plant Losses"; Mr. J. P. Jollyman, entitled "Hydro-electric Economies"; and Mr. R. E. Cunningham, entitled "Losses in Transmission and Distribution Systems." These papers will be found in this and the previous issue of the Journal of Electricity, and should be referred to as additions to the following data.

HYDRO-ELECTRIC ECONOMY

1. What percentage of the theoretical energy in the water taken by any of your power houses is realized at the busbars?

San Joaquin Light & Power Corporation—At our plant known as San Joaquin Powerhouse, consisting of four 4000 kva. impulse driven generators, we attain an average efficiency of 74.47 per cent. That is, we deliver on our busbars the above percentage of the kinetic energy. At our other power houses we are unable to determine absolutely the percentage efficiency, which is secured from the available water, with the exception that we can measure the second feet and from this knowledge compute the results obtained in the busbar. This result varies at the different plants from 55 per cent to 80 per cent efficiency.

Great Western Power Company—We obtain 65 per cent of the theoretical energy in the water power. When the plant was new, this figure was 70 per cent.

Southern Sierras Power Company—We actually obtain an average of 71 per cent combined efficiency at our hydro-electric plants, including all losses and water wasted in governing, etc., while in some cases where no governing is being done, the combined efficiency reaches 76 per cent.

Sierra and San Francisco Power Company—Annual efficiency about 65 per cent; 1490 ft. static head; 1400 ft. effective head. Average use is about 45 cu. ft. of water per kwh. This varies, depending on load factor, speed regulation and elevation of forebay.

2. Where this is known, how do you measure your water?

San Joaquin Light & Power Corporation — At the San Joaquin Powerhouse the water flowing through each of the two pipe lines is measured by Venturi meters, which are equipped with both integrating and recording mechanisms, so that our average of 74.47 per cent efficiency as mentioned under a preceding question is very close to being accurate.

Great Western Power Company—The water was originally measured by the Pitot tube method. Later it has been taken by flow meters.

Southern Sierras Power Company — We measure our water in one case with a General Electric flow meter and in other cases by means of weirs.

Sierra and San Francisco Power Company—The water is conveyed from the converting dam at Sand Bar, through a timber flume approximately 15 miles long to a forebay reservoir, thence to the plant through two pipe lines, under a static head of approximately 1500 feet. The flume has been cross sectioned at a point about 1000 feet from the headworks. A discharge curve has been established from velocity readings taken with a Lally meter. The mean flow for the 24 hours is assumed to be the mean of three daily readings taken at 7 a. m., 12 noon, and 6 p. m. This is converted into millions of cubic feet, from which is deducted any water that may be turned out of the flume to permit of repairs.

The forebay reservoir has a capacity of approximately 13 million cubic feet. From readings of the elevation of the water, taken at 9 p. m., there is determined the amount of water which was stored or used from the forebay, which amount is deducted from, or added to, the net amount delivered into the forebay from the flume. The amount of water in cubic feet is divided by the kilowatt hours generated for 24 hours ending at 12 o'clock midnight, and the quotient is used as a comparative factor in determining the daily efficiency of the plant.

3. To what extent does it pay to get an accurate measurement of the amounts of water going through your plant?

San Joaquin Light & Power Corporation—At our various plants we know absolutely the number of second feet of water delivered to each plant. From this knowledge we can determine closely the efficiency of each plant.

We have been able to avail ourselves of this knowledge to decrease our operating cost. For instance, knowing absolutely the quantity of water which we take from storage and the quantity of water which we obtain from the natural flow of the streams, we have been able to effect a considerable saving by being able to accurately differentiate between the stored water and the natural flow of the stream in making our annual settlement with the government. The additional accuracy in being able to make and record these measurements of water has resulted in cutting down the government charges and as the rate due the government for water increases year by year, the saving will also materially increase.

Great Western Power Company—Accurate measurement of the water is very important in general to determine when turbine repairs are profitable.

Southern Sierras Power Company—As we operate about two-thirds of each year on stored water we consider it absolutely necessary to obtain an accurate measurement of the amounts of water used. In fact, we have established a constant indicating the number of kw. per second foot for water used at each plant, and this constant is worked out daily at the generating plants and incorporated into their daily report. Whenever constant drops below what we consider a good operating efficiency it is the subject of immediate investigation.

Sierra and San Francisco Power Company—It is very desirable. I do not think our method is sufficiently accurate.

Economize by doing it better, and buy a bond with the proceeds—BUY A LIBERTY BOND

A considerable investment and expense is justified in keeping fully informed on the plant losses and efficiency.

4. Have you on impulse wheels any automatic system of closing needles to reduce deflection of nozzles, or of closing by-passes opened on falling loads, and to what extent do they improve your water economy?

San Joaquin Light & Power Corporation—We have no deflecting nozzles on any of our power houses. Control of the water is handled through auxiliary nozzles and by-pass valves which operate only on sudden pressure rises, and are in the nature of relief valves to prevent excessive pressure rise.

Great Western Power Company—With properly equipped relief valves, high head turbines are able to take care of wide fluctuations of load without any loss in water.

Southern Sierras Power Company — On the impulse wheels in our governing plants we regulate the water flow by means of needle nozzles connected to auxiliary needle type relief nozzles. We know that this type of nozzle saves at least 50 per cent of the water that would be wasted in regulation by the deflecting or deflector type of nozzle, but we do not know the exact amount of saving obtained.

Sierra and San Francisco Power Company—No.

5. Have you any cases of special value involving the use of forebays or afterbays to avoid spilling water on account of daily load variations?

San Joaquin Light & Power Corporation — Our water waste is reduced to a minimum. On the San Joaquin River we have not only forebays, but we have afterbays. At one of our power houses we have a small retaining dam which can store approximately 250 acre feet. At the other power houses we can also store a quantity of water. Our waste of water is practically reduced to a minimum, as the dispatcher handles the load and the flow of water in such a way that he can store water during the times of minimum load and let the water out of the forebays and afterbays as the load increases. We have found these forebays and afterbays of exceptional value to enable us to handle the water coming out of storage. During the last year we wasted practically no water. Any water coming from our storage reservoir was used to advantage through all power houses.

Southern Sierras Power Company—On Bishop Creek we have five water power plants, all using the same water and in this case the forebay which serves as the intake for the upper plant is of sufficient size to take care of all daily load variations. The water after being used through the upper plant, is discharged directly into a small forebay which serves as an intake for the next plant below, and this forebay is only of sufficient size to take care of load variations for short periods. This condition applies to the balance of the plants below.

Sierra and San Francisco Power Company—Yes. Peak load capacity, insurance on flume breaks, settling the water to reduce water wheel wear, storage of off peak surplus power from our own system as well as other systems, and delivery during time that there is a demand above the capacity of other plants or systems, or our own flume capacity. We are taking 50,000 kwh. from the Great Western Power Company between 9 p. m. and 5:30 a. m., and delivering back to the Pacific Gas & Electric Company between 7 p. m. and 9 p. m. a portion, or all, depending on our own needs to make up any shortage of power.

Southern California Edison Company—For data on this and other questions on hydro plant economies, see paper by Mr. R. J. C. Wood entitled "Power Plant Losses," forming part of the convention proceedings and published on page 344 of the Journal of Electricity, April 1, 1918.

6. Have you any information on the effect of bucket wheel renewals on efficiency, and can you throw any light on the problem as to when it pays to replace buckets to maintain efficiency?

San Joaquin Light & Power Corporation—No.

Great Western Power Company—Francis type turbines can be improved by at least 2 to 3 per cent by installing clearance bands to reduce the leakage between the scroll case and the runner.

Sierra and San Francisco Power Company—No.

7. Have you had any wheels, nozzles or buckets replaced by others of improved design, and if so, what data have you on the betterment?

San Joaquin Light & Power Corporation—No.

Southern Sierras Power Company — About three years ago the low efficiency at one of our plants was investigated, after which new buckets were installed on three 4000 horsepower wheels, resulting in a net gain of 1200 kw. output using the same amount of water and the same power plant equipment other than the buckets. A year later two sets of water wheel buckets purchased several years ago were replaced by a later design with a resulting increase of 700 kw. on two 2000 kw. units.

Sierra and San Francisco Power Company—No.

Pacific Gas & Electric Company—For answers to this and other questions regarding the conservation of energy in water power plants, see paper by Mr. J. P. Jollyman among the convention proceedings, on the subject of "Hydro-electric Economies." This paper appears elsewhere in this issue of the Journal of Electricity.

8. Can you give data on other hydraulic economies of general interest?

San Joaquin Light & Power Corporation—No.

Southern Sierras Power Company — Other hydraulic economies to which we pay particular attention are liberal designs in intake screens and chambers and the installation of flow line and pressure pipe of liberal size.

Puget Sound Traction, Light & Power Company (submitted by Mr. George E. Quinan on behalf of the Northwest Electric Light and Power Association)—A suggestion along the lines of conservation of equipment, which you do not seem to have covered in your list of questions, would be the possible increase in generating capacity to be obtained by improved ventilation of generating units, whose prime movers have sufficient capacity to carry more load. We have recently increased the continuous rating of two 10,000 kva. General Electric water wheel driven units up to 16,300 kva. each, by installing Sirocco fans on the rotors, enclosing the ends of the machines with sheet iron, so as to obtain maximum use of the air handled, and rewinding the armatures with a mica high temperature insulation. We have ordered material for the rewinding of another machine, a 5000 kva. water wheel driven unit, and will install fan blades on its rotor and expect to get another 1000 kw. of capacity out of it.

There is probably a good deal of generating equipment in use on the Coast built prior to 1913, which would safely carry more load than the operating companies now dare to place on it, and in a good many cases the operators would feel justified in increasing the amount of load carried if they had some means of determining the maximum temperatures reached. In some instances the installation of temperature coils in the armature windings would give the desired information and at a very insignificant cost.

TRANSMISSION AND DISTRIBUTION ECONOMIES

1. What percentage of your total energy generated is sold to consumers?

San Joaquin Light & Power Corporation—1916, 75.6 per cent; 1917, 77.2 per cent.

Great Western Power Company—75 per cent of the total energy generated is sold to the consumers.

Three billion dollars means thirty dollars for every man, woman and child. Are you doing your share?
—BUY A LIBERTY BOND

San Diego Consolidated Gas & Electric Company — Percentage of total generated energy sold during 1917, 77.9 per cent; loss, 22.1 per cent.

Pacific Gas & Electric Company—The percentage of the total energy generated that is sold to consumers is not known exactly. To determine this ratio would involve the addition of hundreds of thousands of meter readings, and this is not done for the system as a whole. It is believed to be between 54 per cent and 64 per cent.

2. Of the difference between the two, do you know how much is lost in your transmission system, and how much in your distribution system; that is, have you sum totals of metered energy passing through your distribution substations?

San Joaquin Light & Power Corporation—Yes.

	1916	1917
Transmission loss	15.8%	15.0%
Distribution loss	8.6	7.8
Total loss	24.4	22.8
Kw. generated	110,920,894	143,129,588
Kw. on substation meters	93,390,360	121,600,477
Kw. sold on register and consumers' meters	83,886,520	110,264,792

Great Western Power Company—15 per cent is transmission high tension step-up and step-down transformer losses, while 10 per cent of the loss is in the distributing system.

San Diego Consolidated Gas & Electric Company—All loss was in the distribution system; operated no transmission system during 1917.

Pacific Gas & Electric Company—The amount of power lost between the generator terminals and the low voltage side of the substation transformers is about 20 per cent. This includes losses in step-up transformers in our own generating plants, the losses in the high tension lines and the losses in all substation transformers. The losses in some of the distributing systems has been found to be between 20 per cent and 30 per cent.

Southern California Edison Company—See paper by Mr. R. E. Cunningham on this subject among the convention proceedings, page 349 of Journal of Electricity, April 1, 1918.

3. What steps have you taken to reduce transmission and distribution losses, and what results do you estimate from such steps?

San Joaquin Light & Power Corporation—We have reduced our transmission and distributing losses by decreasing our mileage of 30 kv. transmission and replacing it by 70 kv. transmission lines. We have built a large number of tie lines, both for transmission and distribution, and reduced the distance between our distributing substations by building additional transformer stations and thereby reducing the length of the distributing lines from the centers of supply.

San Diego Consolidated Gas & Electric Company—Steps taken to reduce distribution losses:

(a) Close check on customers' accounts to note quickly a dead or dying meter.

(b) Routine testing of meters, particularly of large power customers, to catch slow meters.

(c) Elimination of unnecessary transformers. Changing of unnecessarily large transformers. Arrangements made to cut off large customers' banks when not in service.

(d) Selected transformers having 2400 rather than 2200 volt ratings (in the days before the advent of the so-called universal transformer), thus reducing core losses.

Impossible to estimate the results of these steps. System conditions have so changed and average distance of transmission so increased that it is not possible to tell how much of the economies instituted balance the increased losses due to increased territorial extent.

Pacific Gas & Electric Company—Additional transmission lines have been planned to relieve the most heavily loaded parts of the transmission network. Some have been constructed, some are under construction, and the net results are impossible to estimate since the load has grown so rapidly.

A great many additions have been made to the distribution systems with a view to relieving overloaded apparatus. Some distribution transformers which have aged excessively have been removed. The results of this work have undoubtedly been beneficial but are impossible to estimate.

STEAM PLANT ECONOMIES

1. What number of kilowatt hours per barrel of fuel oil do you obtain from each or any of your steam plants, giving brief description of plant and load conditions?

San Joaquin Light & Power Corporation—At our Bakersfield steam plant the following equipment is installed:

One 6250 kva. Allis-Chalmers 1800 r. p. m. turbo alternator, with Alberger surface condenser having 1-inch tubes.
One 5000 kva. Allis-Chalmers 1800 r. p. m. turbo alternator, with Alberger surface condenser having ¾-inch tubes.
Eight 600 horsepower Stirling boilers with super heaters, and
Four 300 horsepower B. & W. boilers with super heaters. Pressure carried on boilers is 200 lbs.
Two Alberger steam turbine driven, four-stage, centrifugal pumps.
Two Cochrane open water heaters.
One turbine driven exciter.
One motor driven exciter.
One Curtis steam turbine and Alberger three-propeller centrifugal pump; capacity approximately 16,000 gallons of water per minute, to handle circulating water.
Two 30-inch centrifugal pumps, driven by tandem compound Harrisburg engine.
One Alberger hotwell and one Alberger dry vacuum pump.

The erection of the plant was started in 1910 and completed in 1911.

With the 6250 kva. machine we obtain an output of approximately 220 kwh. per barrel of oil, and with the 5000 kva. machine we obtain an output of approximately 202 kwh. per barrel of oil.

Great Western Power Company — Beach and Mason Steam Plant, San Francisco: 235 kwh. per barrel of oil, at 100 per cent load factor; one 10,000 kw. unit.

Oakland Steam Plant, Oakland: 230 kwh. per barrel of oil, at 100 per cent load factor; three 3500 kw. units.

Southern Sierras Power Company—Steam plant located at San Bernardino is equipped with seven Class O Stirling boilers, four steam driven Duplex Boiler Feed Pumps, two open feedwater heaters, one fuel oil pumping set; one 3000 kw. horizontal Parson's type steam turbo generator with direct connected exciter, one 5000 kw. horizontal Curtis type steam turbo generator with one M. G. set and one G. E. turbo exciter; each turbo being served by a surface condenser, hotwell pumps and circulating water pumps, in conjunction with two cooling towers, one being of the open type, the other enclosed.

The plant is operated under a variable load, from a maximum of 8000 kw. to a standby, or floating condition. Under the former, an average economy of 220 kwh. per barrel of oil is maintained. The latter condition is met with a consumption of 65 barrels of oil for 24 hours, while floating both units and all auxiliaries, or 27 barrels and 38 barrels, respectively, for turbos as mentioned. This includes the use of one burner under each of the two boilers and two or three other boilers floating on the header line, with the auxiliaries for the turbos in full operation, and also steam admitted to turbo blading, to maintain a temperature of 200 degrees F. while running in a vacuum; it being necessary to hold a temperature that will not be detrimental to turbo blading, by reason of the fact that when steam is not used the peripheral speed of blades generates heat in the vacuum that rises to a point that if continued will loosen the blades and even the bucket wheels from the shaft.

Sierra and San Francisco Power Company—Steam reserve station: three 9000 kw. Curtiss vertical turbines, 18 B. & W. boilers; total rated capacity, 10,400 horsepower. One

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turbine floating on line until called on to pick up load to relieve hydro-electric station.

Load factor, 1917—11%.....kwh. per bbl., 152.5
Load factor, 1916— 5%.....kwh. per bbl., 143.3

Pacific Gas & Electric Company—At Station "A," San Francisco, we often supply the entire load of San Francisco from Station "A" and in addition thereto supply energy to transmission. Again, we very often take large amounts from the transmission carrying either a light load at Station "A" or floating. When running under what might be termed good load conditions, we generate from 223 to 225 kwh. per barrel of oil. When floating or carrying a light load in connection with transmission delivered, of course the efficiency per barrel falls off.

Station "A" has turbine capacity of 42,000 kw. There are also installed in the station two 3500 kw. Union Iron Works triple expansion engines. The boiler plant has a rated capacity of 16,000 boiler horsepower. We have carried peak loads as high as 44,000.

San Diego Consolidated Gas & Electric Company—We obtain from 200 to 210 kwh. per barrel of oil, month in and month out. Maximum daily, about 220. As steam furnished an adjacent gas plant is a considerable portion of total generated, and steam flow meters are not overly dependable, exact monthly figures cannot be given; also lamp black burned further complicates computations. Above figures are correct within 5 kwh. per barrel.

Summary of conditions of operation: 12,270 kw. plant with 39.1 per cent annual load factor. Peak load 8800 kw. Boiler capacity 6694 horsepower. B. & W. water tube boilers, 160 pounds pressure, 75 degrees superheat. Principal generating units, two 4000 kw. and one 2000 kw. G. E. Curtis horizontal turbo generators, 3-phase, 2300 volts, 60 cycles.

Southern California Edison Company—For the economy of the Long Beach plant and an analysis of same, see paper on "Power Plant Losses," by Mr. R. J. C. Wood, appearing as part of the convention proceedings, on page 344 of the Journal of Electricity, April 1, 1918.

2. Does it pay to test fuel oil when purchased for gravity, percentage of moisture and calorific value?

San Joaquin Light & Power Corporation—We constantly make test for moisture in the oil, and also make a gravity test. We have never had occasion to complain of the quality of the oil received from the oil company. We follow up the loading and unloading temperature, and have agreed with the oil company on a basis of charging which is mutually satisfactory.

Great Western Power Company—No, not under present contract conditions.

Southern Sierras Power Company—Fuel oil should always be tested for moisture and also for sulphur, especially when furnace indications show that there is an amount of sulphur present that is detrimental to the boiler tubing.

A calorific value test would prove beneficial when a heavy asphaltum base oil is encountered.

Sierra and San Francisco Power Company—Crude oil, yes. After it has gone through a still, no.

Pacific Gas & Electric Company—It pays to test fuel oil for gravity, percentage of moisture and calorific value, particularly if the contract for purchase of oil specifies the several values noted. Even if the contract does not specify these values it is well to know the various values in order to determine if the plant is operating efficiently and properly.

San Diego Consolidated Gas & Electric Company—We test fuel oil received for gravity and moisture and correct for temperature. Calorific value tested only occasionally. Rebates by reason of moisture content have paid many times over for the equipment and expense of testing. Temperature correction is also of great importance.

3. Have you any definite data on the percentage of steam used in atomization of fuel oil?

San Joaquin Light & Power Corporation—We have never made any test at our plant as to quantity of steam required for atomizing. We use the oil burner manufactured by the Hammel Company. On many tests it has been shown that this burner uses from 2.5 per cent to 3 per cent of steam for atomizing.

Great Western Power Company—In Oakland Steam Plant, ½ of 1 per cent.

Southern Sierras Power Company — The following is from observation and notes during tests made:

The amount of steam used by oil burners for atomization will in the average plant be about 3 or 4 per cent of the total steam generated, but with good furnace conditions, clean burners and hot oil, the percentage of atomizing steam should be reduced to at least 1 per cent of the total generated.

It will be found that the percentage of steam for atomization will decrease as the boiler approaches 100 per cent overload. For example, a boiler operating at

11%	overload	will consume	2.3%	of total steam
at 33%	overload	will consume	2.1%	of total steam
at 38%	overload	will consume	2.02%	of total steam
at 50%	overload	will consume	1.98%	of total steam
at 71%	overload	will consume	1.84%	of total steam
at 100%	overload	will consume	1.35%	of total steam

Sierras and San Francisco Power Company—With good firing, 3 per cent; bad firing, indefinite.

Pacific Gas & Electric Company—We have installed on one of our boilers steam flow meters to determine the output from the boiler, as well as the amount of steam used in atomization of oil, and have found that when working the boiler at normal rating and 10 per cent above rating that the amount of steam is approximately 1 per cent of the total output of the boiler. With this information and with the methods pursued we have equipped the rest of the boilers with devices similar to this boiler under test and from our general experience we are of the opinion that it is possible to use as much as 5 per cent in atomization of oil without any better results.

When working the boiler at ratings of 15 per cent and over the quantity of steam will increase, the amount depending upon the furnace arrangement, size of chambers and on the draft.

San Diego Consolidated Gas & Electric Company — Recent tests to determine the quantity of steam required for atomization with Leahy oil burners, indicate as follows:

Steam Pressure at Burner	Lbs. of Steam per Burner per Hour
100	193½
90	179
70	147

Taking as an example a 520 horsepower boiler which will have three such burners with an average pressure of 100 pounds at the burner at full load, the total consumption for atomization is 3.23 per cent. Exterpolating the above results, consumption at 120 pounds would be 224 pounds of steam per hour. This is believed to be the conditions of operation at load and a half, which would indicate an atomization loss of 2.54 per cent at this load.

4. What has been your experience with heat insulation of boiler settings?

San Joaquin Light & Power Corporation—The boilers in this plant are insulated with the standard insulation used on Stirling boilers, and installed by Chas. C. Moore & Co. We have made no changes, and have added nothing to the heat insulation. We endeavor to keep this insulation up to 100 per cent efficiency.

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Southern Sierras Power Company—Have no data upon radiation losses in boiler settings.

Great Western Power Company—None.

Sierra and San Francisco Power Company—No experience.

Pacific Gas & Electric Company—On many of our old type of boilers we have used a brick of infusorial earth, which brick has been laid against the outside wall of the boiler and adjacent to that part of the furnace exposed to the greatest heat. We have noted that the temperature of this new outside wall is very much lower than the original wall. We have every reason to believe that this raised the boiler room efficiency, although we have no data to give as to the exact amount. We tried magnesia brick in place of the type mentioned above, but found that it would not stand up under the heat exposure.

San Diego Consolidated Gas & Electric Company—We have insulated some of the brick settings of our boilers with "J. M." Airtite Coating. Have no definite data, but believe some losses are prevented.

5. Do you use economizers, and if so, what feed water temperatures do you get ingoing and outgoing?

San Joaquin Light & Power Corporation—This plant is not equipped with economizers. We believe that if it were our output per barrel of oil would be materially increased.

Great Western Power Company—No.

Southern Sierras Power Company—Economizers are not installed in any of the steam plants of this company.

Sierra and San Francisco Power Company—No.

Pacific Gas & Electric Company—We have economizers on one part of our boiler room. The incoming and outgoing temperatures are respectively, 120 to 200.

San Diego Consolidated Gas & Electric Company—We use no economizers.

6. Have you had any experience with automatic control of dampers, fuel oil supply, etc.? If so, with what results?

San Joaquin Light & Power Corporation—No.

Great Western Power Company—Limited application, but so far satisfactory. Merritt system.

Southern Sierras Power Company—From observations made would say that the present methods of automatic control could be improved upon, as the general results are not the most economical to be obtained.

Sierra and San Francisco Power Company—No.

Pacific Gas & Electric Company—We have equipped six of our large B. & W. 680 horsepower boilers with the Merritt automatic oil feed and damper control. While this has not been installed long enough to give any definite information as to results, our short experience leads us to believe that it will be valuable as a fuel oil saver, particularly when operating in connection with the hydro-electric system, where the load variation makes it normally impossible for the fireman to control the oil flow as quickly as it can be done with this automatic system. Even when operating without tying in with the hydro-electric system we believe that with the Merritt system the oil and steam can be accurately adjusted for the load conditions desired, and when this has been done, do not have to rely upon the personality of the fireman each and every time the boiler load conditions change.

San Diego Consolidated Gas & Electric Company—We use automatic control of fuel oil to oil burners by the following means: A Mason spring type fan regulator is inserted in the steam line to the fuel oil pump. This regulator is actuated by boiler pressure acting on a diaphragm and is so adjusted that when in the closed position enough steam passes to the pump to maintain an oil pressure of 40 pounds at the burners. As the steam pressure falls off the regulator opens, consequently increasing the oil pressure. To avoid any chance of over pressure in the oil line, a Witte pressure governor is used between the Mason regulator and the pump, so adjusted that the oil pressure cannot exceed 60 pounds.

With this outfit in good working order, steam can be maintained within plus or minus 2 pounds continuously, even with a rapidly fluctuating demand.

7. Have you modified your furnaces to improve efficiency, and if so, with what results?

San Joaquin Light & Power Corporation—The boilers are furnished with the Peabody furnace, marine type. No change has been made from the original design.

Great Western Power Company — Re-arrangement of checker work in Oakland Steam Plant improved combustion and efficiency between 1 and 2 per cent.

Southern Sierras Power Company—The Hammel oil furnaces have been modified with beneficial results, to the extent of increasing CO_2 readings an average of 40 per cent after a sixty day trial; all furnaces have been changed with the continued results for the past four years.

Sierra and San Francisco Power Company—Yes; too soon to state.

Pacific Gas & Electric Company—About three years ago we modified our furnaces in order to get a greater output from the plant. This modification has since helped us very materially when the price of oil increased. Special attention was paid to the air spaces in the grate, the idea being to bring the air in in such a way as to mix properly with the atomized oil, the result being a raise in efficiency and a greater output of steam from the boiler.

San Diego Consolidated Gas & Electric Company—We use Hammel type furnaces. Some changes have been made in the arrangement of air spaces with apparent increase of efficiency, but we can give no quantitative results.

8. Have you any fuel oil burners that you consider superior in the matter of efficiency? If so, give data.

San Joaquin Light & Power Corporation—From our experience we believe that the Hammel oil burner is equal to any on the market, is economical to maintain, and from the results of many tests, it has been proven that it is an efficient burner.

Great Western Power Company—No.

Southern Sierras Power Company—The Hammel fuel oil burner, as constructed for Stirling boilers, has given very good general results and we have not encountered any type which offers anything better.

Sierra and San Francisco Power Company—No.

Pacific Gas & Electric Company—We have no fuel oil burner that we consider superior in the matter of efficiency. We use a modified Peabody burner, which is of the outside mixing type.

San Diego Consolidated Gas & Electric Company—After experimenting with a number of burners we have settled on the Leahy as being best suited to our needs.

9. To what extent does it pay to equip your fireroom with indicating or curve-drawing instruments, such as draft gages, flow meters, pyrometers, temperature recorders, CO_2 indicators, etc.?

San Joaquin Light & Power Corporation—So far, we have not equipped our plant with any instruments with the exception of a CO_2 recorder, and tests are made of the flue gases. Upon investigation of the results accomplished at other plants, we are of the opinion that boiler room should be fitted with instruments such as draft gages on each boiler, pyrometers and steam flow meters. An automatic system of draft and fuel control such as the Merritt system is also advisable. We have not gone to the expense of installing a fuel control system, as in the very near future we will be using natural gas under our boilers.

Great Western Power Company—Do not know.

Southern Sierras Power Company—Each boiler should

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be equipped with a steam flow meter first; this is the best investment of any single piece of boiler room apparatus and as important as a steam gage; CO_2 recorders are next in importance. The two above instruments, with a thermometer in the stack, or at the breaching connection, will tell the whole story. Other boiler specialties can be used, perhaps, to such an advantage as to make the investment worth while.

Sierra and San Francisco Power Company—No experience.

Pacific Gas & Electric Company—We believe it pays to equip the fire room with such instruments as draft gages, flow meters, pyrometers and temperature recorders, as with these instruments proper logs and records can be obtained in order to properly study plant efficiency and through the medium of these instruments leaks can be discovered. As to the CO_2 recorder, we have yet to find one that will work. We do believe in testing stack gases for CO_2 indication and have found that an Orsat set in the hands of an intelligent man will give far better results than any of the CO_2 automatic devices now on the market.

San Diego Consolidated Gas & Electric Company—Each boiler is equipped with a G. E. Co. Type F. S. 4 (indicating and recording) steam flow meter, and an Ellison draft gage. The flow meters, besides indicating directly thousands of pounds of steam per hour, also have special red points on the scale showing 100, 125, 150, 175 and 200 per cent load. There is a recording thermometer for stack temperatures and a recording CO_2 indicator. As a boiler room load indicator we use lamp banks which indicate automatically the number of valves open on each turbine. As the turbines have decidedly different efficiencies, this is to be preferred to a totalizing watt meter.

We believe these various devices aid the fireman materially in improving economy.

10. What is your opinion on steam versus electric auxiliaries, with special reference to heat balance, assuming the use of feed water heaters?

San Joaquin Light & Power Corporation—At our Bakersfield steam plant we use steam auxiliaries almost exclusively, as the steam is used to heat the feed water. In fact, when we are carrying a 6000 kw. load we hardly are able to raise the temperature of the feed water to as high a degree as we should. Our experience with electrically driven auxiliaries has not been very satisfactory. At the time when shorts and other troubles come on the line the speed and voltage of the generating units decrease and the capacity of the electrically driven auxiliaries also decreases, and at a time when they should be at their best.

Great Western Power Company—For standby stations we prefer electric auxiliaries, with excitation and feed water pumps in duplicate, one electric drive, the other steam.

Southern Sierras Power Company—We believe that with full use of feed water heaters, the steam auxiliary will prove the most economical.

Pacific Gas & Electric Company—As to steam versus electric auxiliaries, this is entirely a question of heat balance, which must be worked out individually for each and every plant; and further, must be watched carefully in each and every plant to see that the proper units (that is, steam or electric) are used during the time of light or heavy load conditions, as the heat balance, of course, changes with the variation of load on plant. It is safe to state, however, that where there is any quantity of feed water used it will pay to install steam driven auxiliaries in order to use the exhaust steam for feed water heating purposes.

San Diego Consolidated Gas & Electric Company—We prefer steam-driven auxiliaries as electric auxiliaries tend to intensify the results of a momentary shut-down. This is of course assuming that steam-driven auxiliaries do not yield too great a quantity of steam to keep the feed water at 212 degrees, and in our plant the balance is such that there is ordinarily no surplus. In case of a surplus we would change from a steam-driven to a motor-driven exciter. We believe a flexible pair of auxiliaries of this type should always be available.

11. How high a vacuum do you carry, and is this measured at the turbine discharge or at the vacuum pump suction?

San Joaquin Light & Power Corporation—On turbine No. 3, on the 6250 kva., the vacuum carried is approximately 28.1 inch. On turbine No. 2, the vacuum carried is approximately 27.1 inch. During the hot summer months the vacuum on either machine is decreased approximately one inch. The vacuum is measured at the turbine discharge.

Great Western Power Company—Vacuum, 28-29 inch, at turbine discharge.

Southern Sierras Power Company—The vacuum usually carried when operating at full load will average 22.5 inch, except in hot summer weather, when it will not be more than 19.5 inch, this being in connection with cooling tower service. The vacuum is measured at the turbo exhaust.

Sierra and San Francisco Power Company—27½ in. at turbine discharge.

Pacific Gas & Electric Company—The vacuum will vary of course with the load on unit. At heavy loads we get about 28.4 inches of vacuum measured by mercury column. The vacuum we measure at the inlet to the condenser. If the vacuum is measured at the pump suction, same will be a little bit higher than at the point above mentioned.

San Diego Consolidated Gas & Electric Company—During the winter months we carry from 28½ in. to 29 in. with a maximum of 29.25. In summer from 28 in. to 28½ in. Vacuum is measured at turbine discharge to condenser.

12. Have you experimented with steam lanes, baffles, etc., in your condensers, and if so, with what results?

San Joaquin Light & Power Corporation—Our surface condensers are equipped with the standard top baffle. No experimenting has been done with these condensers.

Great Western Power Company—No.

Southern Sierras Power Company—Have no data upon the use of steam lanes and baffles in our condensers, more than the claims made by the manufacturers of dry plate type of surface condensers. These types contain a steam lane and diffusion plate to guide the exhaust steam through predetermined paths, so that the greatest amount of tube service possible is presented to the volume of the steam.

Sierra and San Francisco Power Company—Yes. No definite results as yet.

Pacific Gas & Electric Company—With the testing of our condensers we have not endeavored to experiment with steam lanes. We believe, however, that if a condenser is designed with due reference to steam lanes, baffles, etc., that very beneficial results can be obtained. This is shown in the design of what might be termed modern condensers of today where the design takes advantage of these points mentioned. Unless the condenser has been designed originally with this idea in mind, it is probable that not enough improvement can be made to justify the expense necessary to make the change.

San Diego Consolidated Gas & Electric Company—Our No. 2, 4000 kw. turbine was originally equipped with a condenser of 12,000 sq. ft. cooling surface. Tests were made to determine the vacuum in fourteen different locations, and a variation as great as 1.18 in. of mercury was found. A representative from the manufacturers then cut out some of the baffle plates and removed 170 tubes to better steam distribution, and after the change the variation did not exceed .5 in. Our No. 1, 4000 kw. turbine is equipped with a 10,000 sq. ft.

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condenser and gives as good results as No. 2, with 11,500 sq. ft.

13. Have you any data on improvement of vacuum to be obtained by increasing your circulating water supply, and relative costs and benefits to be derived?

San Joaquin Light & Power Corporation—We have a very abundant supply of circulating water, and have not been troubled on this score.

Great Western Power Company—No increase in vacuum by increasing water supply, from tests.

Southern Sierras Power Company—Have no data as to the cost of increasing circulating water supply to increase the vacuum, but from trials made would say that it is not worth the fuel to generate the steam for the circulating pump, the increased number of gallons of water pumped per minute would be considerable to make any change in the vacuum.

Sierra and San Francisco Power Company—No.

Pacific Gas & Electric Company—There is no doubt that by increasing the quantity of circulating water supply, that is up to certain limits, that better vacuum may be obtained. This, however, is a question of heat balance, as the increase of the amount of circulating water put through the condenser may tend to give a little better vacuum, but at the same time reduce the temperature of the condensate to an uneconomical point, and it is again a question of watching the balance between the better vacuum and the lower temperature of the condensate. Where your plant may be located in such a way that the water has to be pumped to the condenser, the question of the cost of pumping and circulating water is also an important question.

San Diego Consolidated Gas & Electric Company — No data.

14. What economies of fuel or increase of efficiency have you been able to obtain in your steam plants by other means than those mentioned above, giving particulars?

San Joaquin Light & Power Corporation—Approximately one year after the plant had been in operation we installed Reilly multi-coil fuel oil heaters, and we estimate that the installation of these heaters increases the efficiency of the plant approximately 4 per cent.

Southern Sierras Power Company—Have nothing to offer upon this question.

Pacific Gas & Electric Company—In our steam plant we have endeavored by means of special devices to reduce the quantity of steam used in oil atomization; and to carefully watch the temperature of the ingoing and outgoing water used in the condensers, so as to adjust to a proper balance between vacuum and the temperature of the condensate. The installation of feed water heaters, together with the question of heat balance and steam versus electric auxiliaries is most important. Only by watching carefully all of the little details in a large plant can economical operation be obtained. We might add here that by taking tests on the condensate and on the feed water supply to the boilers to determine whether there are any leaks of salt water in the condensers, we have been able to get very good results in avoiding replacement of boiler tubes, together with reduced cost of having boilers down for cleaning, etc.

San Diego Consolidated Gas & Electric Company—The following additional apparatus and means of bettering plant economy have been utilized:

(a) Have installed Vulcan Soot Blowers. Find them labor-saving, and undoubted producers of increased boiler efficiency.
(b) Have installed Copes Feed Water Regulators.
(c) Use a combination water and air, condenser tube cleaner which is a great labor-saver and does thorough work, thus improving vacuum. Can now afford to clean condensers oftener.
(d) Have extended jetties into the bay to deep water, producing the following results: Better supply at times of low water; less silting up of channel and consequently less dredging required; condensers stay cleaner; discharge separated from intake at low tide so that cooler water is obtained.
(e) Have given careful attention to steam pipe coverings and leakage of boiler settings.

15. What is the deterioration of steam turbines in the matter of steam economy due to wear or erosion of nozzles, buckets, intermediate and diaphragm plates, increase of clearance, etc?

San Joaquin Light and Power Corporation—There is no doubt that the steam economy of any turbine decreases as the wear or erosion of the nozzles and buckets increases. A turbine is guaranteed by the manufacturer to deliver a kilowatt hour with a certain steam consumption, but as the machine remains in service this consumption is increased. Whenever a machine is opened it is apparent to the eye that the buckets are worn. Buckets and nozzles no longer have the original sharp edges. Here and there a bucket or nozzle will be found broken, and experience with our plant shows that when the plant was new we obtained better economy from a barrel of oil than we do at the present time.

There is another feature connected with the use of steam turbines operating in parallel with hydro plants, such as on our own system, which should receive the careful attention of the coming meeting. This is the fact that the blading of turbines breaks down due to the heavy shorts which the machines are subjected to when operating in parallel with a high tension system. We have had the blading of our turbines break down on several occasions, and apparently no means of relief have been found to decrease the hazard. The installation of current limiting reactance coils would probably help the situation, but is there not some other method of protecting turbines against the tremendous strains they are subjected to? When a short comes on the line the throttle opens wide and the turbine blading fails.

This is a condition which we have all gone up against, and is one of the most serious situations existing, especially at this time when the shortage of water is so pronounced and we will all have to operate our steam plants to the utmost during the coming season.

Southern Sierras Power Company—The operation of No. 1 turbo has covered a period from June 3, 1912, to date, and has generated 7,499,700 kwh., and No. 2 turbo being in service since March, 1913, to date, and has generated 11,728,100 kwh. The stationary and moving blading of both turbos are in excellent condition and show no erosion whatsoever.

The principal cause of erosion seems to be in the water from which the steam is generated. If the water contains an average of 5 parts in 100,000 of free nitric or sulphuric acid or highly organic matter, it will start action on the turbo blading. These do not seem to do all of their work in the boiler, but pass over with the steam and attach the composition material of the blades. Salt water, or a stream containing organic matter used for condensing water, usually give more or less tube trouble, when the conditions become such that the tubes admit water to hot well of condenser. Boiler and turbo trouble may then be expected.

Scale formations may be removed from turbo blading by feeding a barrel of coal oil into the first stage while the machine is under slow rotation. The amount used should be upon a basis of one barrel per 5000 kw. turbo and usually cleans thoroughly, but care must be taken not to permit the oil to get into the hotwell piping or the heater, but must be discharged through the sewer.

Pacific Gas & Electric Company — We have not tested our turbines since installation to see whether the steam economy has decreased, but from an examination that we have made of the buckets at various times, practically no wear has been noticed.

San Diego Consolidated Gas & Electric Co.—We have found no evidence of deterioration of nozzles and blades in our turbines. Certain blades damaged in an accident seem to be giving way somewhat.

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Sierra and San Francisco Power Company—We noticed recently that one of our 9000 kw. vertical shaft turbo generators would not turn out as much power with all valves open as when new, the discrepancy being approximately 2000 to 2500 kw. The fireroom force also claimed that they could not hold steam on this unit without several more boilers than required for the same load on either one of the other two units.

As soon as the unit could be spared, we removed one section of the turbine shell, the section chosen being that directly below the steam manifold supplying the valves opened below half load. This gave access to the intermediates getting the most wear. It was found that rotor buckets in the second and some of the following stages had been flattened by screw heads which had snapped off and gone through part of the steam route. The rotor buckets especially in the low stages were partly filled with densely packed dirt. Some diaphragm vanes above the fourth and fifth stages were corroded, in some cases to the extent of having holes eaten right through.

The blades were straightened and cleaned, and the machine restored to service, but it has not up to date been loaded heavily enough or run under load long enough to determine definitely the extent of the improvement. There are, however, indications that the maximum overload is back within 1000 kw. of that when new, and the fireroom force no longer requests the chief to back this machine away from the load.

REPORT OF SUB-COMMITTEE ON INSULATOR DETERIORATION

BY J. A. KOONTZ

(If it were possible to eliminate failures in insulators on transmission lines, it would be possible to shut down all standby steam plants the majority if not all the time. The vital nature of the insulator depreciation problem and the importance of the part the West is taking in the solution of the difficulty make the report of this portion of the Engineering Committee one of peculiar timeliness. The author is electrical engineer with the Great Western Power Company of San Francisco.—The Editor.)

The sub-committee on insulators has the following work to report. After several informal meetings at which a portion of the committee were present, we arranged to have a general meeting, and all committee members spent the day of October 20th with Professors Ryan and Clark at Stanford University, going thoroughly over the insulator question.

Professor Ryan reviewed the field on tests made in the past, briefly discussing how at first practically all efforts were directed to the development of a high duty megger, using a direct current of 25,000 volts or more, and a galvanometer of the highest sensibility. With this apparatus, he was able to readily distinguish between 20,000,000 megohms and infinity rather than 2000 to 5000 megohms and infinity, such being the accuracy of the commercial instrument. With his delicate apparatus he was able to determine that good porcelain insulators of the suspension type had a resistance of from three-quarters to one and one-half million megohms at ordinary temperatures, and that the temperature had a very decided effect on the insulator resistance, this resistance decreasing rapidly with increase of temperature.

While these studies were extremely interesting and valuable in determining the character of porcelain, they had not given the desired results about suspension insulator deterioration and failures. In attempting to find porosity and make the insulators absorb moisture, numerous units were placed in the laboratory yard and exposed to the weather conditions. At first, during dry weather, they were sprinkled several times a week and since they were placed with the skirts upward, were generally wet. After a few months, these insulators began to show numerous failures when high voltage was applied, though the high duty megger in general did not detect these faults. The insulators were not absorbing moisture to any extent, but apparently cracking on account of the temperature cycles to which they were subjected. These cracks which cause failure between stud and cap are the progressive effect of numerous temperature changes.

Suspension Type Insulator Tests

TABLE I – Yard Treatment

Series	A	HSA	L A	B	BL	C	G	H	J	Q1	Q2	S	Totals
Figure Maker Date of Mfgr	3 A 1912	3 A 1912	4 B 1912	4 B 1916	4 B 1913	3 A 1913	9 C 1908	C 1916	5 A 1916	7 D 1916	8 D 1916	3 A	
No tested	74	92	98	58	92	82	59	15	92	47	47	102	856
No treated in Yard	74	77	79	57	84	69	57	15	92	47	44	91	786
Yard days	192	196	224	189	186	168	201	201	200	255	255	129	
Dates Month Day	3 6	3 6	3 6	3 6	3 6	3 6	3 6	3 6	3 6	4 15	4 15	4 15	
Failed 20 Kilovolt Megger	0	0	5	3	2	2	0	0	0	2	3	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	1	2	22
Failed S O, cap	0	0	7	6	17	4	17	1	0	3	16	12	5	2	0	0	0	0	2	0	0	2	2	3	5	10	22		136
Failed S O, disc	0	0	0	2	0	0		0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	0	0		7
Failed Prior to yard Treatment	0		15		19		1		8		13		2		0		0		0		5		11		72				
Failed After Yard Treatment	0		10		21		0		18		5		0		0		2		4		9		24		95				
" " %	00		13.0		26.6		00		21.5		7.2		00		00		2.2		8.5		20.4		26.4		-				
Failed Total, No	0		25		40		1		26		18		2		0		2		4		12		35		165				
" " %	00		27.2		40.8		1.75		28.3		22.0		3.4		00		2.2		8.5		25.6		34.3		19.2				

* 2 in each lot failed from 30 to 70 K.V. – required for flashover 85 K.V.
** 1 " " " " 50 to 70 K.V. – " " " " "
*** 6 " failed from 50 to 65 K.V. – " " " " "
* Date upon which yard treatments began.

Results of failure tests—Table 1

Test results obtained by Professor Ryan are shown in the accompanying Tables No. 1 and No. 2.

Professor Ryan emphasized the following points in relation to suspension insulators enduring temperature cycles and divided them into two classes:

Class I—"Many fail by cracking through caps."

Class II—"Few, if any, fail by cracking through caps."

In Class I, our tests have produced abundant evidence that failure by cracking is greatly accelerated by:

(1) Temperature changes;

(2) Oscillating 60 cycle spark-over-voltage.

No evidences were found that temperature changes and spark-over-voltage affected materially insulators in Class II.

"Our tests to date have demonstrated that the best treatment of cap and stud insulators to develop their lack of durability is to subject them continuously to many temperature cycles and test them at suitable intervals for failure due to formation of cracks in the caps by spark-over-voltage."

Mr. Barre, in aiding the insulator committee, suggested that insulators of the suspension type with only the stud cemented in place should be tested, as any expansion of the stud due to temperature increase would place the porcelain in tension which might cause much of the trouble. The cap, when in place, would either produce compression in the porcelain or relieve it of any tension depending on the temperature and would not be likely to cause trouble.

Your committee was unanimous in the belief that the latest design in the cap and stud class of suspension insulators should be subjected to "thermal

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fatigue" tests. Professor Ryan offered the facilities of the Electrical Engineering Department of the University for conducting such tests, and stated that he and Professor Clark would be able to direct this work along lines similar to those carried on in the past for the power companies.

It was decided to ask the leading porcelain manufacturing companies to donate 200 suspension units of the cap and stud type, 100 units complete with hardware, 100 units without hardware or cement, and 50 units with just the stud cemented in place.

SUSPENSION TYPE INSULATOR TESTS.

Series	A	A3A	LA	B	BL	C	F	G	N	U	Q_1	Q_2	S	Totals
No. in Plate	76	34	20	57	33	32	31	57	15	20	43	25	33	353
No. in Basement	0	33	28	0	33	31	0	0	0	0	0	0	32	157
Intervals Series	0 10 15 17	0 10 15 17	0 10 15 17	0 10 15 17	0 10 6 11 17	0 10 15 17	0 10 15 17	0 10 15 17	0 10 15 17	0 10 15 17	0 10 15 17	0 10 15 17	0 10 15 17	
Intervals No. of Days	116	121	108	117	110	110	75	113	115	110	107	107	115	
Failed S.O. Cap	0	0 3	1 15	0 9	1 10	0	0 10	0 13	0 1	3	0	0	0 5	0 10	0	0	0	0	1	3	7	0 5	0 10	0	0	0	0	0	0

You can't substitute anything in place of your duty — BUY A LIBERTY BOND

SUBSTITUTE FOR CEDAR POLES

BY L. M. KLAUBER

(Cedar poles had been growing scarce even in peace times, and with war demands in the lumber camps are now practically impossible to obtain. The forced use of substitutes has given rise to many problems in selection and treatment which only experiment and time can satisfactorily answer. Report on the progress of these experiments and results obtained thus far are presented below as part of the report of the Engineering Committee for the Pacific Coast Section, N. E. L. A., convention of May 9-11. The author is in charge of the electrical department with the San Diego Consolidated Gas & Electric Company. —The Editor.)

This sub-committee was appointed on September 8 last, to draft specifications for the purchase of timber for pole use as a substitute for cedar, with particular reference to Douglas fir. Owing to the fact that the other member of the committee was compelled to give up the work, due to the pressure of other business, our investigation has been by no means complete. However, as the writer's company has had some experience with Douglas fir poles during the past year, it is deemed advisable to present such data as have been accumulated.

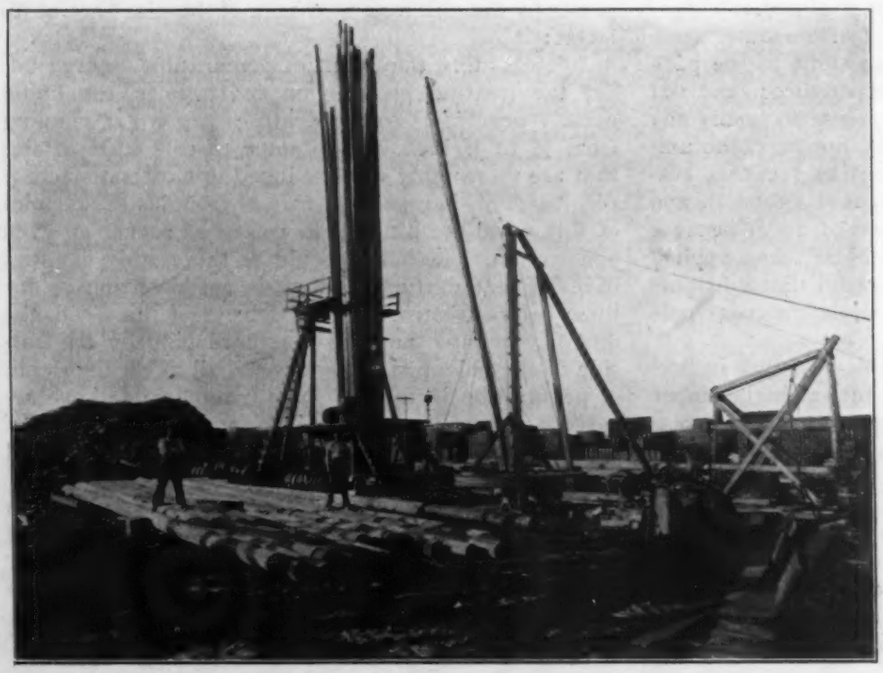
Availability of Western Red Cedar and Douglas Fir

Western red cedar poles, which have for years formed the great bulk of the poles used for supply lines in this section, began to be scarce in the early spring of 1917. At first the difficulty appeared to be one of transportation; a considerable quantity of poles was said to be available at Washington and Oregon shipping points, but these could not be obtained owing to the lack of cars and lumber schooners. Gradually this supply was dissipated, and by fall it was practically impossible to secure cedar poles in Southern California, especially in the larger sizes. A few were brought down as deck loads on Douglas fir rafts, and some rafts arrived with cedar mixed in with the fir. In any case the supply was by no means equal to the demand and substitute poles were used in quantity during the last half year. The shortage first due to transportation difficulties, as noted above, eventually developed into an actual material shortage, concerning which one well-known lumber dealer makes the following statement: "Owing to war conditions, and the action of the government in demanding that all the energies of the loggers be devoted to the production of spruce and Oregon pine for war purposes, it is practically impossible to secure cedar poles. In addition, practically all of the cedar timber lands tributary to transportation have been cut over, and even under normal conditions, cedar poles are constantly becoming harder to get. It is only a matter of time until it will be necessary to turn to a substitute." It is the opinion of lumbermen that the best substitute for cedar available on this coast is Douglas fir (or Oregon pine, as it is usually termed in this section), owing both to its availability and characteristics.

The enormous quantities of Douglas fir available in the Northwest are well known. It is estimated that 25.4 per cent of the entire standing timber supply of the United States is Douglas fir.* And since this timber is cut and shipped in great quantities for all structural purposes, it is nearly always available in our commercial centers.

In considering any timber for use as supply line poles, certain characteristics demand first consideration; these are, availability, cost, strength, and dura-

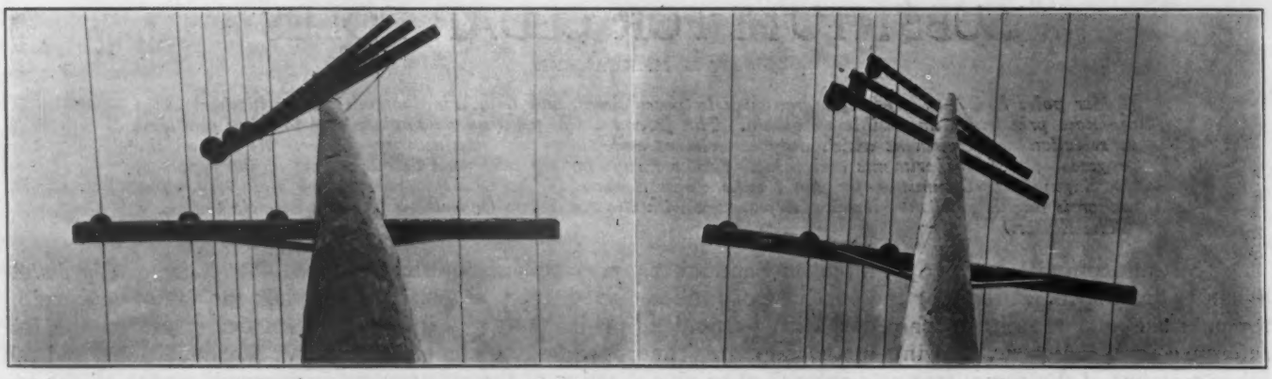
*Structural Timber Handbook on Pacific Coast Woods, O. P. M. Goss, page 6.



TREATING PLANT FOR FIR POLES

There is a cylindrical tank 8 feet in diameter and 10 feet 6 inches high, at the bottom of which is a steam radiator consisting of 116 feet of 2-inch pipe. Over the steam coil is a grid of channel iron upon which the butts of the poles rest. A steam derrick completes the outfit.

You must have poles enough to carry the load—BUY A LIBERTY BOND



TWISTING OF DOUGLAS FIR POLES

The tendency to spiral as displayed by Douglas fir poles is one of their chief drawbacks.

bility. Availability has been mentioned; cost is naturally closely related therewith since the timber found in the greatest quantities will usually be the cheapest in first cost, and is in this case. The strength of Douglas fir is well known. Says the U. S. Forest Service Bulletin No. 88: "Douglas fir may, perhaps, be considered as the most important of American woods. * * * As a structural timber it is not surpassed, and probably it is most widely used and known in this capacity." Therefore, in considering Douglas fir as a substitute for cedar, durability is the most important point, since it is the characteristic in which the former is lacking as compared with the latter.

One of the best posted men on poles in the business makes this statement: "The best substitute that can be had on this coast is Douglas fir, and we believe that while in their green state they would be subject to early rot at the ground line, still, after treating with creosote above the ground line, a Douglas fir pole will give very good satisfaction. We do not claim that it will last as long as cedar, but we are under the impression that if properly prepared and treated, its life would be 90 per cent as great as that of cedar."

We have not at hand any data from other companies which have employed Douglas fir in the past, as to the life which they have experienced, and our own installations are entirely too recent to justify any estimates as to probable life. It is, however, the universal belief of pole producers that to secure a reasonable life, an open tank treatment is essential, and that the brush treatment often used on cedar because of its low cost is practically worthless when applied to Douglas fir. Some authorities claim that a fir pole with an open tank treatment will outlast a cedar pole with a brush treatment.

While an open tank treated pole is higher in first cost than a brush treated pole, because of higher labor cost, fixed charges and greater quantity of preservative absorbed, the cost is by no means excessive, varying from 28 to 40 per cent of the first cost of the untreated pole in the yard.

A small treating plant which was used in treating several hundred Douglas fir poles varying in length from 50 to 75 feet is described as follows: There is a cylindrical steel tank 8 feet in diameter and 10 feet 6 inches high, at the bottom of which is placed a steam radiator consisting of 116 feet of 2-inch pipe. Over the steam coil was placed a grid of channel iron upon which the butts of the poles rest. A steam derrick completes the outfit.

In operation, poles are placed in position and the tank is filled with the specified preservative 6 inches above the depth required by the particular size pole under treatment. Steam is then turned on and the liquid heated to boiling point, or about 220° F. and held at this temperature. The length of time the boiling continues depends entirely upon the character of the poles being treated. Dry poles are usually boiled for one hour; green poles, if necessitated by the exigencies of the construction program, are boiled from two to eight hours to insure thorough impregnation. After the boiling is complete, steam is turned off and the tank is allowed to cool to normal temperature, with the poles still immersed. Cooling in this manner insures the absorption of a maximum of preservative, although it is said that the penetration is not increased.

With reference to penetration, the following statements by the mill man in charge of the plant are of interest:

"Regarding the depth of penetration secured under the treating process, on cedar poles, the liquid usually penetrates to the depth of sap wood, running from ½ to ¾ inch, and in some cases 1 inch. Poles that are thoroughly dry produce the most satisfactory results. This is especially true of Douglas fir, as poles of this wood are difficult to treat and secure an even penetration. The poles should be thoroughly dry, but in many that are furnished we do not have time to dry them before treatment. The density of the wood, the quantity of pitch and the case hardening on the outside of the pole during the drying, all affect the depth of penetration in fir. In some instances we have secured a penetration of one inch, and within a foot of this location on the same pole the penetration would be only ¼ inch.

"The sap wood on Douglas fir is as a rule much smaller than cedar and the same penetration cannot be secured as in cedar on this account. It is virtually impossible to treat the heartwood in any species. Our experiences agree with the experiments of the U. S. government."

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Other Characteristics of Douglas Fir

Other points which may be mentioned in connection with the use of Douglas fir poles are: Taper, weight, hardness, appearance, checking, and tendency to spiral.

The taper in Douglas fir poles is not so great as in cedar, and consequently modifications are required in the specifications covering this point. The natural taper of a cedar pole is about 1 inch in every 10 running feet, so that the average 45 foot cedar pole having an 8 inch top will have a 12 inch butt.* But in a Douglas fir pole the taper will only be about 1 inch in 15 feet, so that a 45 foot fir pole with an 8 inch top will have only a 10½ inch butt. As it is undesirable to reduce considerably, sizes at the ground line, particularly in dealing with a material more subject to decay than cedar, it becomes necessary to modify the specifications for tops as well as for circumference at the butt. It is therefore recommended that the Class A Douglas fir pole have a top not less than 31½ inches in circumference (10 inches in diameter), Class B, 28 inch, and Class C, 25 inch. We then have the following table of minimum dimensions, replacing in the Douglas fir specifications the standard table for Western red cedar. (Handbook of Overhead Line Construction, N. E. L. A., 1914, page 129.)

Minimum Dimensions of Poles in Inches

Length of Pole in Feet.	Classes A (Minimum Top Circumference 31½ in.) Circumference 6 Ft. from Butt	B (Minimum Top Circumference 28 in.) Circumference 6 Ft. from Butt	C (Minimum Top Circumference 25 in.) Circumference 6 Ft. from Butt
30	37	33	30
35	38	34	31
40	39	35	32
45	40	36	33
50	41	37	34
55	42	38	35
60	43	40	37
65	44	41	38
70	45	42	39
75	46	43	40
80	47	44	41

It will be noted in comparing the above table with the cedar specification that, in spite of the increase in top dimensions the butt diameters are considerably less than cedar poles of corresponding grades, particularly in the larger sizes. This of course cannot be avoided unless top sizes are still further increased for each class of pole which, owing to cost, weight, appearance and other considerations, does not seem advisable. Companies using long poles for particularly heavy work should specify Class A poles having a certain proportion of 11 inch and even 12 inch tops. It may be remarked in passing that the cedar specification appears to be impractical in some details, with reference to the dimensions of poles secured on this Coast, being evidently based on a pole having a greater natural taper than we secure. We have heretofore in purchases been often compelled to modify the specifications, slightly reducing the required butt diameter in long Class A poles. The uses to which the several classes of poles are to be put, and the various proportions of each class to be specified in any order, do not, of course, come within the province of this report.

* "Butt" measurements are 6 feet from the butt.

Air seasoned Douglas fir is said to weigh 34 pounds per cubic foot, air seasoned cedar 33 pounds. The oven dry weights of the two woods are 29 pounds and 25 pounds, respectively. It is evident that Douglas fir poles of similar dimensions will be heavier than cedar, but long poles of similar class, being smaller at the butt, will be lighter than cedar when dried to the same condition.

Douglas fir poles are harder than cedar and more difficult to climb, especially after they have dried and "case hardened." This fact is universally noted by linemen. It is possible that if these poles come into general use, pole steps may again come into favor for certain classes of service.

As Douglas fir poles run straighter and slimmer than cedar, they make even better appearing poles. When trimmed and shaved they are generally dark red in color, whereas cedar is white, and they are consequently more conspicuous until thoroughly weathered. Although prohibited in the specifications, it is believed that poles used in city work, whether of cedar or fir, should be shaved.

Under similar conditions, Douglas fir seems to check less than cedar and the cracks do not run so deep. This difference, however, is not marked and varies greatly in individual cases.

Douglas fir poles, especially when set slightly green, have a decided and unpleasant tendency to spiral. Some rather bad examples are illustrated in the accompanying photographs. Almost every pole has more or less of a twist, as can be plainly seen by the checks, but some appear to untwist much more than others while drying and weathering. As the twist is, however, less than a complete turn in 20 feet, no change need be made in the cedar specification, this being the present limit. (Handbook on Overhead Line Construction, N. E. L. A., 1914, page 131.)

Conclusions

The standard specifications for the purchase of Western red cedar poles can be used in purchasing Douglas fir, except as to dimensions. The new table of dimensions given above is recommended.

It is not believed that Douglas fir poles will displace cedar as long as the latter are obtainable at a reasonable price. The inferiority of Douglas fir to cedar poles was thus summed up by a lineman: "They rot faster, you can't drive a spur into a dry one with an axe, you can't tell which end is the top, and they twist a line out of shape as they dry." Nevertheless, these difficulties can be overcome. Douglas fir is the best substitute for cedar to be procured on this coast, and the lumbermen predict that the cedar shortage will soon render their use general.

It has been suggested by one prominent lumberman that our association co-operate with the Forestry Department of the Federal Government and the principal pole producers, and study the pole question from the practical side, obtaining data as to the exact available supply of standing timber of the various species suitable for pole use. By co-operation of this nature, we will determine what kinds of poles can be secured and make our specifications accordingly.

Men for the war, business for the war, money for the war — BUY A LIBERTY BOND

WAR SERVICE POWER PROBLEMS

(Conservation of power resources and conservation of energy are the subjects especially chosen for engineering discussion at the coming war service convention of the Pacific Coast Section, N. E. L. A. A series of valuable papers by experts in all phases of the problem are promised and interestingly analyzed in this report of the Engineering Committee.—The Editor.)

The violent world history of the past year has so reacted on American finance and industry as to result in the most distressing effect on public utilities in California and neighboring states, far removed as their activities may appear to be from the cause of the disturbance.

While their loads have grown at a higher rate than normal, the financing of betterments has become almost impossible, and even where possible, the cost of new equipment has become nearly prohibitive. In the rare cases where extensions can be financed, and it is felt that their cost can be afforded, the time required to get new equipment makes them unavailable for immediate needs. The engineers of the member companies of this section of the association have, therefore, been hard pressed during the past year to make two kilowatts grow where one grew before.

The cost of our fuel, crude petroleum or still residuum, has in general doubled during the past year. Labor costs have increased 25 to 50 per cent, and maintenance and repair materials have gone up in approximately the same proportion. The result has been a great increase in our costs per kilowatt hour, even where the bulk of the energy is obtained from hydraulic sources. In almost all such cases we depend upon steam to help carry our peaks and our load during the low water season. On account of war industrial demands our peaks have grown; irrigation for war-time food supply promises to greatly increase our load during the low water season, and even nature has been unkind to us in the Sierra Nevada mountains in reducing precipitation so that our run-off during the past winter has been unusually low, and our prospects for the next dry season are not encouraging.

For these reasons the engineers of your member companies have been forced during the past year to give operating economies much more intense study than heretofore.

It is then but natural that we should take as the subjects for the engineering discussion at the coming convention:

First: Conservation of power resources.

Second: Conservation of energy, whether in the form of the kilowatt hour, the elusive British thermal unit, or the corresponding hydraulic dimension.

Little more can be done than the obvious in the conservation of hydraulic power sources already in service. Where they are the limiting factors, generator capacities can often be increased by forced ventilation. In some cases where the penstocks, buckets and generators are ample, capacities can be increased by enlarging the nozzles. Other slight increases of capacity can be obtained by means outlined in the accompanying papers on the subject of increases in economy. The main opportunity for conservation in the development of new hydro-electric power sources is the concentration (possibly of various interests) on the development of such sources as will give minimum cost per kilowatt consistent with output during dry seasons, short time of construction, nearness to market, etc. A paper will be presented for the consideration of the convention by Mr. F. H. Fowler, district engineer of the U. S. Forest Service, and consulting hydraulic engineer of the Federal Fuel Administration, which will analyze the principal hydraulic possibilities of the Sierra Nevada mountains along these lines.

In the southern part of the state a very large proportion of the total water power is now developed by one property, that of the Southern California Edison Company. One of the engineers of this concern, Mr. H. A. Barre, has prepared for the convention an analysis of the power situation in that territory from the viewpoint of conservation.

In central and northern California the water power resources are divided between a larger number of companies, among which conservation of existing facilities can best be obtained by interconnection, and a discussion of this has been prepared by Mr. J. P. Jollyman of the Pacific Gas and Electric Company.

Conservation of Energy

On account of the fact that practically all hydro-electric installations operate during their early years with a surplus of water, efficiency is given little consideration compared with the study of this feature in a steam plant. For this reason, opportunities for considerable increases of kilowatts per second foot often appear later, and under present conditions may become highly remunerative when steam generated energy can be saved thereby. Mr. E. C. Hutchinson has prepared for the convention a discussion of improvements in this respect that were found typical of average high head impulse wheel plants.

Data on experience along this line has been collected by the engineering committee in the form of answers to a questionnaire. This data as presented by Mr. J. P. Jollyman, on behalf of the Pacific Gas and Electric Company, is so comprehensive that the committee believes it will be to the advanage of those attending the convention to publish this matter together, instead of splitting up the answers and segregating them with those of other companies.

The questionnaire also covers losses and possible economies in transmission and distribution systems and in steam power plants. The data on transmission and distribution losses in the network of the Southern California Edison Company as prepared by Mr. R. E. Cunningham, is particularly commended to the convention. The losses in both the hydro-electric plants and the steam plants of the Southern California Edison Company have been analyzed for the convention in such a way by Mr. R. J. C. Wood that they also are

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presented as a whole and aside from the answers to queries in the questionnaire.

Sub-Committee Reports

The work carried out during the past year by the sub-committees appointed by the engineering committee may be summarized as follows:

Several sub-committees have been engaged in an advisory capacity on the preparation of codes of rules to be made effective by government commissions affecting the engineering work of the utilities in California. The engineering committee has appointed representatives on a board of twenty members charged by the State Industrial Accident Commission with the preparation of safety orders applying to electric power stations and substations. A brief report of this committee's work to date is included in the proceedings of the convention.

Another sub-committee has been assisting the California State Railroad Commission in the preparation of a safety code applicable to overhead line work. The work of this committee cannot be made public until acted upon by the commission.

Several members of the engineering committee have served during the last five years on the Joint Committee of Inductive Interference appointed by the California State Railroad Commission. This joint committee has completed its work and made its final report with recommendations for a new code of regulations to supersede General Order No. 39, but action on this work has not as yet been taken by the commission.

The work of the sub-committee appointed to investigate the deterioration of porcelain insulators has been greatly interfered with by priority rights of the government to the personnel engaged on this work. A brief report of this committee's work to date, with plans for the future, is separately presented.

Mr. R. C. Powell was appointed a sub-committee of one to collect all pertinent data on the subject of iron and steel conductors, and he has submitted a report which will not only save our engineers much time in getting the information required for such cases, but which adds to previous publications considerable original matter.

Standardization of pin type insulators and pins to avoid the necessity of stocking of several different insulators for the same service has been allotted to Messrs. L. M. Klauber and R. E. Cunningham, who have made recommendations to the convention for the standardization of these items.

On account of the growing scarcity of cedar poles, a sub-committee of one, Mr. L. M. Klauber, was appointed to collect data on the suitability of the timber available in the greatest quantity as a substitute, namely, Douglas fir. The report on this subject includes notes on butt treatment and reinforcing in case of decay.

Co-operation of Our Neighbors to the North

During the past year two members of the engineering committee of this section attended as the representatives of the section the convention held in Spokane, in September, 1917, of the Northwest Electric Light and Power Association. These engineers reported a strong feeling of fellowship on the part of the Northwest section and a spirit in favor of closer co-operation between the two sections. As a result, the chairman of the engineering committee of this section was made a member of the corresponding section (known as the Hydro-electric and Technical Committee) of the Northwest association, and the chairman of that committee, Mr. George E. Quinan, was made a member of the engineering committee of this section.

No other change in the personnel of the engineering committee has occurred during the year, with the exception of the resignation of Mr. J. G. Scrugham, who has received a major's commission in the United States army and has gone into the Federal service.

In closing this report, the engineering committee wishes to express its appreciation of the work of the various engineers who have contributed to its proceedings.

REPORT OF REPRESENTATIVES ON THE PREPARATION OF SAFETY ORDERS

At the request of Mr. John R. Brownell, superintendent of safety of the Industrial Accident Commission of California, Messrs. J. A. Lighthipe, J. A. Koontz, M. C. McKay and J. P. Jollyman were appointed to represent the Pacific Coast Section of the N. E. L. A. on a committee of twenty members charged with preparing safety orders for electrical supply stations and equipment, which would be recommended to the Accident Commission as the basis for their orders on this subject.

At the first meeting of the committee, it was agreed that Part 1 of Circular 54 of the Bureau of Standards would be used as a guide for the proposed orders, and that the orders should be consistent with the Electrical Utilization Safety Orders issued by the Accident Commission and made effective January 1, 1917. J. P. Jollyman was chosen chairman of the committee and W. T. Bivins vice-chairman. Sub-committees were appointed among whom was divided the work of preparing the orders.

At the second meeting of the committee the reports of the sub-committees were received and the entire subject gone over. Most of the definitions and orders recommended by the sub-committees were approved. The balance were referred back to the sub-committees for revision. Among the matters referred back are some of the most important and most difficult. The sub-committees have done a considerable amount of work on the revisions and they hope to have their reports ready for consideration by the whole committee within a few weeks.

It appears probable that the orders which will be recommended will represent a material abridgement and revision of the Station section of the code proposed by the Bureau of Standards.

With joint operation, we can win — BUY A LIBERTY BOND

JOINT OPERATION OF POWER COMPANIES

BY J. P. JOLLYMAN

(The interconnection of power lines has been one of the methods of war service suggested and practiced for the war conservation of fuel resources throughout the West. In Central and Northern California a further step has been taken in the joint operation of power companies, which permits of even greater economies and exchanges. The developments which led up to the present situation, as well as possibilities of future co-operation are here discussed in an interesting way by the engineer in charge of electric construction with the Pacific Gas & Electric Company, San Francisco. The paper is submitted under the report of the Engineering Committee for discussion at the coming Pacific Coast Section, N. E. L. A. convention.—The Editor.)

During the latter part of 1917 the power companies of Central and Northern California began to feel in full the effects of the war. The cost of labor and supplies had increased; the cost of fuel oil had doubled, and interest rates had increased nearly 50 per cent. In fact it was generally understood that utility financing should not be undertaken, unless it was for extensions essential to the winning of the war.

These conditions naturally caused a greatly increased cost of operation and stopped all hydro-electric development. While the use of electric power may have been curtailed in some lines of industry by war conditions, its use in other lines was so greatly increased that the total power generated during 1917 showed a normal annual increase. At the close of the year there was every reason to believe that the same rate of growth might be expected during 1918.

That the increased cost of operation could not be met by the savings from such economies as had been made and could be made became evident, and the companies were forced to apply for authority to increase certain of their rates.

The abnormally low rainfall during the fall of 1917 and early winter of 1918 curtailed the output of the hydro-eelctric plants and made necessary the use of much additional steam power at a time when it was realized by all that a reduction in the rate of use of fuel oil was very important.

Realizing the conditions, the Railroad Commission made a study of the power situation in Central and Northern California to see what could be done to meet the emergency created by the war. A report on the engineering features of the problem was prepared under the direction of Mr. F. E. Hoar, gas and electric engineer of the commission, by Mr. G. S. Jacobs. This report presented an extensive study of the effect of combining the loads and facilities of the several power companies. Additional interconnections were suggested between the Northern California, Great Western and Pacific companies as a means of more fully utilizing their existing facilities and an extension of the system of the California-Oregon Power Company, to connect with the Northern California Company at Kennett, was proposed as a means of bringing additional hydro-electric power to the central part of the state.

To obtain a review of the power situation in the entire state the Railroad Commission initiated Case 1176, entitled: "In the matter of the construction and operation of the utilities during the emergency created by the war." Two committees of executives were appointed, one for Southern California, the other for Northern California. The northern committee appointed a committee of engineers to work with the engineers of the commission on the technical problems involved. This engineering committee gave very careful study to all the suggestions made in the commission's report, and made a report of which the following is a brief summary:

1. The capacity of the existing interconnections (see Appendix I) between the several power companies was greater than had been generally supposed.

2. Under present load conditions no water would be spilled by the Sierra or Pacific companies at any time of the year. The Great Western would spill some water during the flood water season through the night hours, amounting to about 200,000 kwh. per day, although its peak load exceeds its hydro-electric capacity.

3. The only possibility of absorbing any of this surplus of hydro-electric energy was found in the Sierra company, which had spare forebay capacity, and whose load was such that they could receive about 60,000 kwh. per day and return it to the Pacific or Great Northern during the day and after the evening peak.

4. This exchange of power could be made over existing interconnections.

5. Other possible interconnections of the Great Western, Sierra and Pacific companies were given careful consideration, but were found inadvisable because of technical difficulties or inexpedient in view of the cost of the possible benefits.

6. By extending the lines of the California-Oregon Power Company, from Costella to Kennett, and raising their voltage to 66 kv. about 9000 kw. could be delivered to the Northern California Power Company continuously from the existing plants of the California-Oregon. This would give the Northern a surplus capacity which would enable it to deliver about 12,000 kw. at 80 per cent load factor, to the Pacific company, at Colusa, with certain addition to the transmission facilities of both companies. The plan considered involved the expenditure of approximately $1,000,000 on the part of the three companies.

The California-Oregon has on hand an additional 12,500 kva. unit, which it can install in its Copco plant, and the Northern has possibilities for some additions to their facilities which would make possible another 12,000 kw. hydro. output in 1918. To deliver this additional power to the bay region would require a higher transmission voltage than 60 kv.

The plan for utilizing the surplus of the Great Western has been carried out and is now in operation.

After the war—depends on winning the war—BUY A LIBERTY BOND

The plans for the delivery of additional power from Northern California are under consideration. The interested parties are working on the engineering details and the question of finance.

Just before the commission received the reports of the committees for Southern and Northern California, the United States Fuel Administration called together the companies using steam power in the central district for the purpose of ascertaining what economies in the use of fuel oil could be obtained by the joint operation of the several plants. It was found that some of the steam plants could be shut down during the night if standby service could be given from the plants continued in operation. The existing interconnections were found to be adequate for this purpose. This plan has been put into effect so far as possible and is still in the process of evolution, as the best plants to run depend somewhat on the conditions of hydro power supply.

With the single exception of the California-Oregon Power Company, all the companies north of Fresno are now interconnected and are being operated, so far as the utilization of hydro-electric power and the saving of fuel oil are concerned, substantially as if under a single ownership. The transmission lines feeding into the bay district are kept loaded to their maximum capacity with hydro-electric power during the day and evening, but are unable to supply all the demand, and some steam power must be used. During the night these lines are kept quite fully loaded carrying the all night load and the power exchanged between the companies. The only interconnected companies having any hydro-electric power not fully utilized are the Great Western, who may have a little during the night, and the Northern California, who have a small surplus which cannot be utilized on account of the lack of suffiicient transmission facilities from Chico into San Francisco, to which point the power must be taken if any further reduction of steam is to be effected.

The technical problems arising from this interconnected operation were quite fully discussed at a meeting of the San Francisco Section of the A. I. E. E., on February 28, 1918. Papers and discussions were contributed by Messrs. P. M. Downing, G. S. Jacobs, J. E. Woodbridge, W. G. B. Euler, and the writer.

APPENDIX "A"

Capacity of Existing Interconnections Between the Power Companies Operating in Central and Northern California

I—In the Bay Region:

*1. Pacific Gas and Electric Company, and Great Western Power Co., at Oakland	5,000 kw. at 11,000 v. 12,000 kw. at 60,000 v.
2. Pacific Gas and Electric Company and Sierra and San Francisco Power Company in San Francisco:	
(a) Bay Shore—Martin	10,000 kw. at 11,000 v.
(b) North Beach—Station F	15,000 kw. at 11,000 v.
(c) Martin—Bryant Street	4,000 kw. at 11,000 v.
(d) Martin—Geneva	4,000 kw. at 11,000 v.
3. Great Western Power Company and Sierra and San Francisco Power Company:	
Tie line connecting steam plants	9,000 kw. at 11,000 v.

II—In Other Parts of Northern and Central California:

*1. Pacific Gas and Electric Company and Snow Mountain Water and Power Company at Santa Rosa	6,000 kw. at 60,000 v.
*2. Pacific Gas and Electric Company and Western States Gas and Electric Company at Folsom	3,000 kw. at 60,000 v.
*3. Great Western Power Company and Western States Gas and Electric Company at Folsom	1,000 kw. at 22,000 v.
*4. Sierra and San Francisco Power Company and Western States Gas and Electric Company at Manteca	2,000 kw. at 30,000 v.
*5. Pacific Gas and Electric Company and Western States Gas and Electric Company at Stockton	2,000 kw. at 2,200 v.
*6 Pacific Gas and Electric Company and Northern California Power Company at Chico	10,000 kw. at 60,000 v.
*7. Northern California Power Company and Western States Gas and Electric Company at Junction City	3,000 kw. at 60,000 v.
*8. Pacific Gas and Electric Company and Coast Counties Gas and Electric Company at Davenport at Morgan Hill	2,250 kw. at 24,000 v. 3,000 kw. at 24,000 v.
*9. Sierra and San Francisco Power Company and Utica Gold Mining Company at Angels Camp	1,000 kw. at 17,000 v.
10. There is at the present time under construction a connection between the Sierra and San Francisco Power Company and the Coast Counties Gas and Electric Company at San Juan	3,000 kw. at 24,000 v.

*These interconnections are in daily service.

SOCIAL RECONSTRUCTION AFTER THE WAR

Theodore P. Shonts, president of the Interborough Rapid Transit Company, of New York, in a recent address made some constructive suggestions for the future. Mr. Shonts said, in part:

"All schools of political and social thought, even the most conservative, agree that epochal economic and social changes will result from the present war. We may, therefore, admit without debate that a return to pre-war conditions is impossible. The call now is for a program of constructive foresight.

"Social well-being undoubtedly demands an improvement in the general condition of the workers; and causes of social and economic injustice must be weeded out if the spread of propaganda, far more destructive than Socialism, is to be checked.

"Uncontrolled competition produces economic waste. Privately controlled industry avoids waste, but creates a tendency toward monopoly with swollen fortunes. On the other hand, governmental ownership and operation, in the light of experience, spells inefficiency. I believe, however, that the efficiency of private operation and the benefits of governmental control can be secured through a partnership between the government and private industry, thus leaving room for individual initiative with corresponding reward.

"In the past we have kept elaborate statistics on the causes of accidents, on the causes of rail and signal failures, and of all classes of material But what fundamental statistics do we keep on the causes of failure and of the dissatisfaction of labor? Comparatively none, although of the two, labor (satisfied and efficient) is the more valuable asset.

A co-operative association of industry and labor would go far to relieve the community of perpetually recurring strife. The government, on the other hand, would be left free to discharge those functions which improve society as a whole."

Improve your opportunity of helping—BUY A LIBERTY BOND

IMPROVEMENTS IN WATER WHEEL EFFICIENCY

BY E. C. HUTCHINSON

(Much of the old machinery of power plants which has proven inefficient in the light of modern installations may be raised to higher level of economy by the modification of its obsolete parts. A consideration of the changes possible through improvements in water wheel runners and water economizing nozzles is submitted in this paper as part of the Engineering Committee's report for the Del Monte convention of the Pacific Coast Section, N. E. L. A. The author, who is chief engineer with the Pelton Water Wheel Company, has had peculiarly favorable opportunity to study these problems in their actual operation.—The Editor.)

Many existing water power plants were built when economy was given comparatively little consideration; cost, reliability and governing being the main considerations, since surplus water was generally at hand. Even where economy was given attention comparable with that which it now deserves, many details of design for improving the efficiency were not as well understood as at present. In many such cases modifications can be made to improve the economy, and it has been my good fortune to make a study of a number of such cases.

The work has naturally fallen into three classifications:

1st. Improvement in power output by the installation of modern water wheel runners, the balance of the equipment remaining the same.

2nd. Improvement of power output through the decrease of water consumption by installation of the modern water economizing nozzle.

3rd. General improvement of the entire unit to the maximum degree by installing both modern water wheel runners and water economizing nozzles.

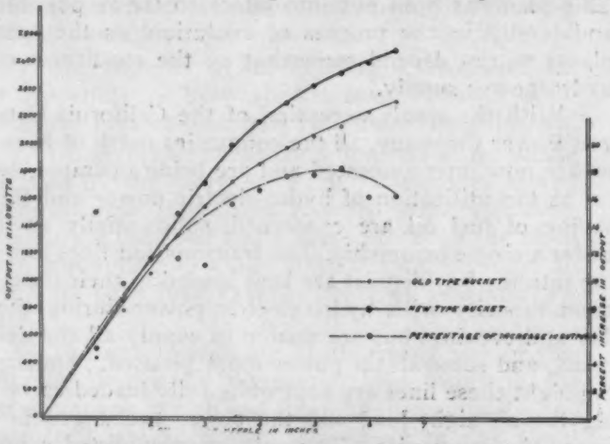
To best illustrate the possibilities under these three classifications, I have prepared two diagrams, both of which are based upon actual operating conditions taken from existing plants.

Diagram No. 1 shows characteristic curves of the results obtained by substituting a new and modern high efficiency form of bucket on an existing water wheel runner, the center of which is not modified. The reconstruction in this case consists of removing the old type buckets from the original runner center or body and mounting in their place the modern and more efficient form of bucket.

The diagram also shows clearly the percent of increase in power output obtained by the substitution of the modern bucket. While this diagram shows plainly the benefits obtained by the change in buckets, and is from this viewpoint very satisfactory, it does not, however, represent the extreme gain which can be obtained if there is an opportunity to modify the diameter of the complete water wheel runner and the number of buckets to provide the most favorable relations for any given set of conditions. To carry out the reconstruction in this form is generally productive of even better results; but is not always convenient, as it may mean pressing off of the shaft a number of rotating parts, which have long been set to their established positions. Those who have attempted the removal of parts that were pressed to place a number of years before, will recognize what this means in labor, and particularly in time.

There have at times been opportunities to alter the wheel diameter by turning down the wheel center or body, while it still remains in place on the shaft. With some designs of equipment, this has proven very successful.

Again, conditions have been encountered in the reconstruction or modernizing of the older plants, which have made it impractical to attempt to install



INCREASE IN POWER OUTPUT

Characteristic of the results obtained by substituting a new and modern high efficiency form of bucket on an existing water wheel runner.—Diagram 1.

the modern form of bucket. This sometimes comes about through insufficient clearances between the extreme outer diameter of the rotating wheel and stationary parts of the wheel housing, nozzle or governing mechanism. The modern form of bucket is somewhat larger in all its dimensions than the older type and the major increase of size is in a direction radial with the wheel axis. As a result, it nearly always happens that a new set of buckets installed on an old wheel center or body makes the complete runner larger in diameter than before.

Chart No. 2 has been prepared to illustrate an average daily load curve in a large system carrying practically every class of commercial load. The curve is plotted to show:

The water consumption over an average period of 24 hours and at 100 per cent efficiency.

First above this load line is a broken line, which represents the water consumption at 100 per cent efficiency and when using a deflecting nozzle or rigid nozzle with a jet deflector.

In either case the nozzle is presumed to be fitted with a hand operated needle, by means of which the operator will be able to make hourly setting to provide for the flow of always a sufficient amount of water above the actual load line to insure reasonable speed regulation.

We have got to show that democracy is efficient to win—BUY A LIBERTY BOND

It will be recognized that with any form of nozzle, excepting that which is automatically controlled by the governor and consequently by the load upon the water wheel, a certain amount of water must necessarily be wasted continually from the nozzle, if there is to be a certainty of the water wheel unit being able to at once take care of any slight modification of load above the normal.

In the case of the automatic governor controlled needle nozzle, the amount of excess or regulation water is reduced to a minimum and is in the majority of plants not in excess of 5 per cent.

The heavy line following the curve of water consumption at 100 per cent efficiency, but somewhat above it, represents the water consumption over the daily load line, and assuming an 80 per cent average water wheel efficiency with water economizing and auxiliary nozzle equipment, assumed to be wasting 5 per cent of water.

The uppermost broken line of the diagram above the last named curve represents the water consumption in a plant which also has an average efficiency of 80 per cent, but has a deflecting nozzle or rigid nozzle and jet deflector with a hand operated needle set as closely to the load as possible once every hour.

The shaded portion between the curve of water consumption with the governor operated needle nozzle and the hand or separate motor operated needle nozzle represents the water loss resulting from the use of the old type equipment.

To better illustrate this water loss, at the bottom of the diagram an additional curve is shown. This water loss or surplus water consumption with which no useful work is performed, is given in percent over the daily load curve which has been taken for the general example. This represents an average water loss of approximately 12 per cent.

Assuming, therefore, the same classification as previously above outlined and giving consideration to the particular case which has been generally described, the following may be stated:

1st. The change of water wheel buckets resulted in an increased power output (without an increase of water) of..... 18%

2nd. The installation of modern nozzle equipment, replacing the earlier form of deflecting nozzle or rigid nozzle with jet deflector, either of these being fitted with a hand or motor operated needle, will result in an average water saving over a 24 hour period, of..... 12%

3rd. The combination of cases numbered 1 and 2, which would result if the plant were improved by furnishing both modern water wheel runner and modern water economizing nozzle, is practically 32%

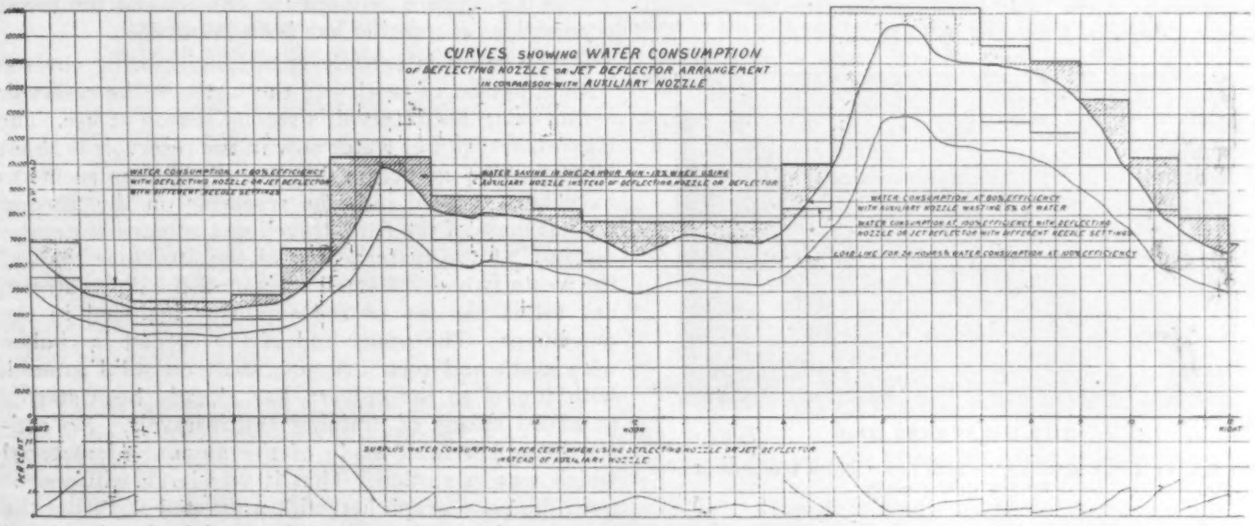
Or almost one-third better efficiency than that at which the plant was operating prior to the change.

The example which has been taken for this discussion is not by any means extreme, but represents no more than an average proposition, conservatively considered.

It is of course impossible to state, before an investigation, what results can be obtained in any particular plant.

In the above discussion, consideration has been given essentially to the possibilities for improvements of power output in impulse or tangential water wheel installations. No consideration has been given to such economies of operation as fall distinctly within the sphere of the plant operator or load dispatcher.

There are of course a great number of ways in which economy can be obtained in any large system of plants, when linked together, as of course there are then opportunities for operating the individual plants at their known points of maximum efficiency and using only those plants which are most efficient at low or fractional loads for regulating. In many plants which are but portions of a large operating system, an investigation along these lines has frequently developed the opportunity to install high efficiency water wheel units of either the impulse or reaction type and having such characteristics as to provide highest efficiency at their


CURVES SHOWING WATER CONSUMPTION
OF DEFLECTING NOZZLE OR JET DEFLECTOR ARRANGEMENT
IN COMPARISON WITH AUXILIARY NOZZLE
WATER CONSUMPTION AT 80% EFFICIENCY WITH DEFLECTING NOZZLE OR JET DEFLECTOR WITH DIFFERENT NEEDLE SETTINGS
WATER SAVING IN ONE 24 HOUR RUN - 12% WHEN USING AUXILIARY NOZZLE INSTEAD OF DEFLECTING NOZZLE OR DEFLECTOR
WATER CONSUMPTION AT 80% EFFICIENCY WITH AUXILIARY NOZZLE WASTING 5% OF WATER
WATER CONSUMPTION AT 100% EFFICIENCY WITH DEFLECTING NOZZLE OR JET DEFLECTOR WITH DIFFERENT NEEDLE SETTINGS
LOAD LINE FOR 24 HOURS WATER CONSUMPTION AT 100% EFFICIENCY
SURPLUS WATER CONSUMPTION IN PERCENT WHEN USING DEFLECTING NOZZLE OR JET DEFLECTOR INSTEAD OF AUXILIARY NOZZLE
NOON
MIDNIGHT
PERCENT

AVERAGE DAILY LOAD CURVE

Water consumption with the use of a deflecting nozzle or a jet deflector arrangement in comparison with an auxiliary nozzle.—Diagram 2.

Don't fail when the pressure comes — BUY A LIBERTY BOND

point of continuous operation, without respect to their efficiency at lower or fractional loads.

Generally speaking, the impulse or tangential water wheel has a much flatter efficiency curve characteristic than the reaction turbine; yet great economy has been effected under certain conditions by the replacement of some impulse wheels with reaction turbines, which will deliver a higher efficiency at a point of continuous load output.

On the other hand, there have also been instances (not a few in fact) where because of the great variation of load and the much better fractional load efficiencies to be obtained by impulse water wheels of the multiple runner, duplex nozzle type, replacements of reaction turbines have been effected in a field which, under ordinary conditions, would appear to lie altogether beyond the proper bounds of impulse or tangential water wheel construction.

Furthermore, a very considerable improvement in power output has been obtained by installing turbines of the modern reaction type to replace turbines of the older and earlier forms of design. Under present conditions, however, there is no question that the water wheel installations of the impulse or tangential type offer the best opportunity for increased power output, with the least additional expense to purchaser, as most forms of turbine construction do not permit of modification by the substitution or replacement of detail parts for the purpose of increasing efficiency and power output from the same amount of water. The result is that most reaction turbine improvements are made by installing complete new units.

THE CALAVERAS DAM CATASTROPHE

On Sunday, March 24th, the up-stream face of the Calaveras dam, now under construction by the Spring Valley Water Company, sloughed off and slid into the reservoir. The dam has a broad core built by the hydraulic fill method and is to have an ultimate height of 240 feet. It had been carried up to a crest height of about 200 feet, at which elevation there had been a cessation of the hydraulic work to give the material already deposited time to solidify.

THE CALAVERAS DAM

The dam as it was, showing the gate tower which was pushed over by the sliding earth

As described in the Journal of Electricity in the issue of February 15, 1917, dry clay, sand and gravel are taken from the western side of the canyon and dumped on the upper and lower faces of the dam so that the width of dry material from the up-stream side toward the center is about one-third this distance, while on the down-stream side it is one-half the distance from edge to center. The remaining central portion of the dam, representing about 60 per cent of its width, is hydraulicked in from the surrounding hills. The material deposited as hydraulic fill ran about 50 per cent clay and 50 per cent sand and gravel. There is a large concrete culvert under the dam, resting on rock foundation and located to the west of the creek channel. The gate tower rose from the upper end of this culvert. The accident occurred about half-past seven o'clock in the morning. There was no preliminary warning. The tower, a well-reinforced structure, was torn from its connection with the culvert by the sliding earth and overturned. It is not known where the rupture between the culvert and the tower occurred, as inspection has been impossible.

THE DAM AFTER THE BREAK

This shows a view of the dam from the opposite side after the break. The up-stream face, whose crest extended from the eminence indicated in the rear of the picture to the observer, has entirely given away. The line of the former slope is shown by the embankment in the rear.

The tower is entirely out of sight, being covered with a blanket of earth and the water in the reservoir —this being the reservoir's second season of use. The maximum depth of water now in the reservoir is about 55 feet. The up-stream dry face of the dam seems to have been carried into the reservoir on the moving central mass of the dam, traveling a somewhat greater distance at the easterly end of the structure than at the westerly end. A small amount of the down-stream dry fill at the top of the dam was included in the movement. The upper end of the culvert is choked with earth and rock. A new shaft on solid ground, with tunnel to the culvert, has already been started to afford means of draining the reservoir. No estimate has yet been made of the amount of material which was in motion. That it was large will appear from the photograph herewith presented and from the fact that the total amount of material, already placed in the dam, had been 2,800,000 cubic yards.

Bake ovens for the boys cost money — BUY A LIBERTY BOND

INDUSTRIAL ELECTRIC HEATING

BY E. A. HOLLOWAY (CHAIRMAN), J. B. BLACK, E. B. WALTHALL

(Electric heating is finding daily a wider application. A birdseye view of the present situation, with much that suggests further opportunities is offered by the data here presented. A valuable bibliography and a plan for continuing the work are further included in the report, which forms part of the general Commercial Committee's data for the Pacific Coast Section, N. E. L. A., convention. The authors are all in authority in the commercial and sales departments of their respective companies.—The Editor.)

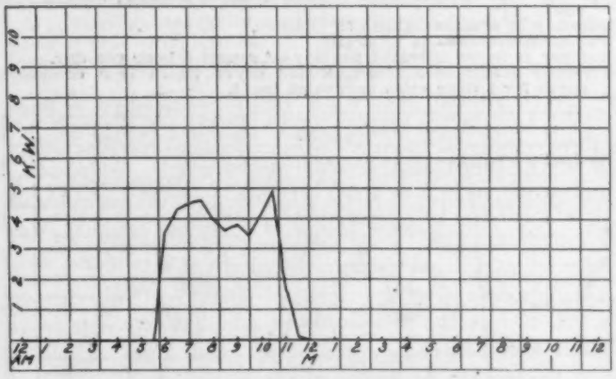
It was the intention of this committee to gather together as much available data on industrial heating from companies throughout the Pacific Coast Section as possible in the short time allotted. We have succeeded in collecting some very valuable information from the member companies, but we feel that this work is so important that it should be carried on throughout the entire year to get the best results.

The committee desires to make the following recommendation to the Commercial Committee of the Pacific Coast Section:

1st. That an Industrial Heating Committee be appointed at once after the April meeting to carry out the work of compiling data on industrial heating installations on the Pacific Coast.

2nd. That this committee collect such data and file it with the secretary of the Pacific Coast Section for use by member companies.

3rd. That as much of the data collected as possible be published in electrical papers.



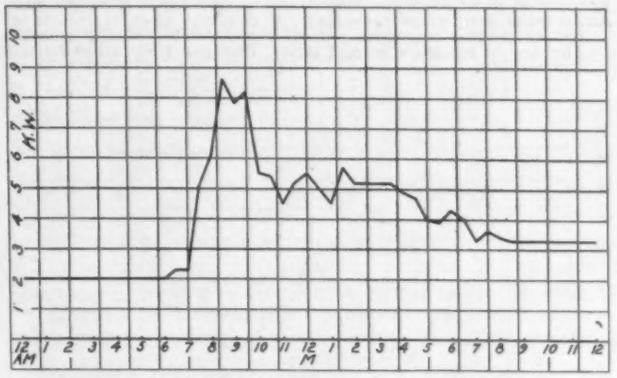
COMPOSITE CURVE MADE FROM SIX DAILY CURVES AT IDEAL CAFETERIA, FRESNO

Sum of all highest daily peaks, 33 kw.
Average peak, 5.5 kw.

Equipment installed: One Hughes bake oven..... 5 kw.
One two-burner hot plate..... 2.6 kw.
Total ..... 7.6 kw.

Data on Electric Bake Oven

Name of Firm—Ideal Cafeteria.
Location—Fresno.
Name of appliance—Bake oven.
Manufacturer of appliance—Hughes Electric Heating Company.
Construction of apparatus—Metal, tile decks, mineral wool packing and open type units wound on asbestos coil.
Size—34 x 24 x 66 in. high.
Shape—Rectangular as per dimensions above.
Watts connected load—Five kilowatts.
Control—3-heat control on each unit.
Number of heating units—Four.
Temperature to be maintained—350 degrees to 600 degrees Fahrenheit.
Cycle of heating operations—Oven is operated from 6 a. m. to 11 a. m. daily, 7 days per week.
Duration of process—From 20 minutes to 50 minutes.
Maximum demand—Five kilowatts.
Number of hours operated per day—Five hours.
Load factor—1.22 per cent.
Diversity factor—See attached load curve which is a composite curve for 6 days (also connected load).
Number of kilowatt hours per month—440 kilowatt hours.
Amount of work done per month—Baking for 800 meals per day.
Advantages over other fuel—Ease of control. Cost of fuel in direct proportion to output. Greater comfort in cooking quarters. Absence of smoke, dirt and dust. Cheaper than other fuels in this locality.
General discussion—More uniform results in cooking. Less shrinkage of food.

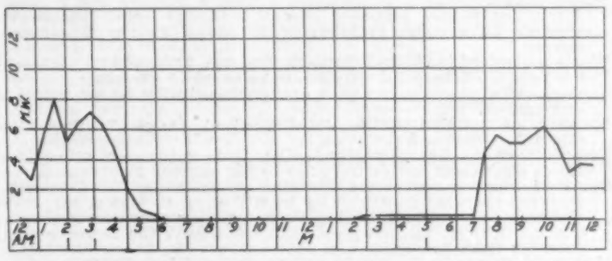


COMPOSITE CURVE MADE FROM SIX DAILY CURVES AT HOCKHEIMER & CO., BAKERSFIELD

Sum of all highest daily peaks, 58.0 kw. Average peak, 9.6 kw.
Equipment installed: One Hughes bake oven, 10 kw.

Data on Electric Bake Oven

Name of firm—Hockheimer & Company.
Location—Bakersfield, California.
Name of appliance—Bake oven.
Manufacturer of appliance—Hughes Electric Heating Company.
Construction of apparatus—Metal, tile decks, mineral wool packing, and open type units wound on asbestos coil.
Size—35 x 45 x 73 in. high.
Shape—Rectangular as per above dimensions.
Watts connected load—Ten kilowatts.
Control—3-heat control on each unit.
Number of heating units—Five.
Temperature to be maintained—350 to 600 degrees Fahrenheit.
Cycle of heating operations—Used 6 days per week.
Weight of material heated—No data available.
How material is handled—By hand.
Duration of process—From 20 to 40 minutes.
Operation—Hand controlled, non-automatic.
Maximum demand—Ten kilowatts.
Number of hours operated per day—Nine hours.
Load factor—1.6 per cent.
Diversity factor—See attached load curve, which is a composite curve for 6 days (also connected load).
Number of kilowatt hours per month—1212 kilowatt hours.
Advantages over other fuels—Ease of control. Cost of fuel in direct proportion to output. Greater comfort in cooking quarters. Absence of smoke, dirt and dust. Cheaper than other fuels in this locality.



COMPOSITE CURVE MADE FROM SIX DAILY CURVES AT VALLEY GRILL, FRESNO

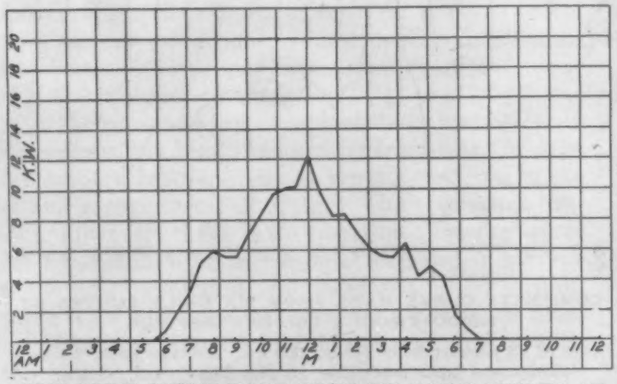
Sum of all highest daily peaks, 55.4 kw. Average peak, 9.5 kw.
Equipment installed: One Hughes bake oven, 10 kw. capacity.

Data on Electric Bake Oven

Name of firm—Valley Grill.
Location—Fresno.
Name of appliance—Bake oven.
Manufacturer of appliance—Hughes Electric Heating Company.

It's our business to provide the current to keep things running—BUY A LIBERTY BOND

Construction of apparatus—Metal, tile decks, mineral wool packing, and open type units wound on asbestos coil.
Size—35 x 45 x 73 in. high.
Shape—Rectangular as per dimensions above.
Watts connected load—Ten kilowatts.
Control—All units have 3-heat control with snap switches.
Number of heating units—Five.
Temperature to be maintained—350 to 600 degrees Fahrenheit.
Cycle of heating operations—From 8 p. m. to 4:30 a. m. daily.
Weight of material heated—All pastry for about 1500 meals per day.
Duration of process—From 20 to 40 minutes.
Operation—By hand.
Maximum demand—Ten kilowatts.
Number of hours operated per day—Eight and one-half hours.
Load factor—3.1 per cent.
Diversity factor—See attached load curve which is a composite curve for 6 days (also connected load).
Number of kilowatt hours per month—1554 kilowatt hours.
Amount of work done per month—All pastry for 1500 people daily.
Advantages over other fuel—Ease of control. Cost of fuel in direct proportion to output. Greater comfort in cooking quarters. Absence of smoke, dirt and dust. Cheaper than other fuels in this locality.



COMPOSITE CURVE MADE FROM SIX DAILY CURVES AT LIBERTY MARKET, FRESNO

Sum of all highest daily peaks, 81.6 kw.
Average peak, 13.6 kw.

Equipment installed:
One General Electric range	11 kw.
One Ruttenber range	5 kw.
One Hughes bake oven	10 kw.
Total	26 kw.

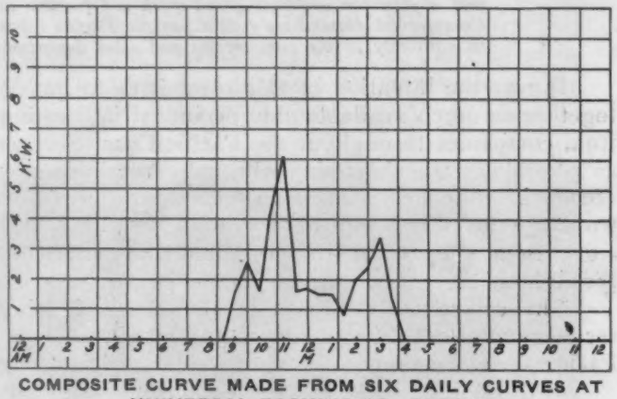
General discussion—More uniform results in cooking. Less shrinkage of food.

Data on Industrial Electrical Cooking Installation in a Delicatessen

Name of firm—Liberty Market.
Location—Fresno.
Name of appliances—2 ranges and 1 bake oven.
Manufacturer of appliance—1 range made by the Ruttenber Co., 1 range by the Rathbone-Sard Co., and the bake oven by the Hughes Electric Heating Co.
Construction of apparatus—Rathbone-Sard range entirely of metal enclosed type burners. Ruttenber range, metal and terra cotta open type burner. Hughes bake oven built of metal lined inside with metal walls insulated with mineral wool. Heating units of the open coil type wound on asbestos tubes. Oven equipped with tile decks.
Size—Rathbone-Sard range, 28 x 54 x 52 in. high. Ruttenber range, 29 x 35 x 51 in. high. Hughes bake oven, 35 x 45 x 73 in. high.
Shape—Rathbone-Sard range cabinet type, 4 burners and 2 ovens. Ruttenber range, 3-burner domestic range, oven underneath. Hughes bake oven, rectangular in shape as per dimensions above.
Watts connected load—Rathbone-Sard range, 11 kilowatts. Ruttenber range, 5 kilowatts. Hughes bake oven, 10 kilowatts.
Control—All equipment has each unit equipped with 3-heat switches and control.
Number of heating units—Rathbone-Sard range, 8. Ruttenber range, 5. Hughes bake oven, 5.
Temperature to be maintained—The temperature on all of the above equipment varies from 250 to 600 degrees Fahrenheit.
Cycle of heating operations—Rathbone-Sard range used in delicatessen operates continuously from 7 a. m. to 5:30 p. m. Ruttenber range used for baking Parker House rolls operates from 8 a. m. to 5 p. m. Hughes bake oven used for fancy pastry, operates from 8 a. m. to 5 p. m.
Maximum demand—Twelve kilowatts on total installation.
Number of hours operated per day—Eleven hours.
Load factor—1.2 per cent.
Diversity factor—See attached load curve which is a composite curve for 6 days (also connected load).
Number of kilowatt hours per month—930 kilowatt hours.
Advantages over other fuels—Absence of heat, smoke, fumes, dirt and dust. Ease of control. Better quality of work. More reliable in the exactness of results.
General Discussion—This equipment is installed in an open market where the public can witness the meats and pastry during their cooking process, which is a decided advertising value to the consumer, and the advantages of electric cooking in general apply to this installation.

Data on Bake Oven Installation

Name of firm—Universal Packing Company.
Location—Fresno.
Name of appliance—Bake oven.
Name of manufacturer—Hughes Electric Heating Company.
Construction of apparatus—Metal walls, mineral wool insulation between the walls, tile decks, open type heating units wound on asbestos tubes.

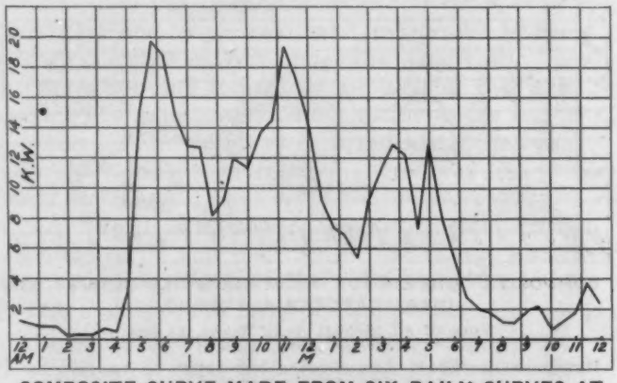


COMPOSITE CURVE MADE FROM SIX DAILY CURVES AT UNIVERSAL PACKING CO., FRESNO

Sum of all highest daily peaks, 56.4 kw.
Average peak, 9.4 kw.

Equipment installed: One Hughes bake oven, 15 kw.

Size—35 x 45 x 69 in. high.
Shape—Rectangular as per above dimensions.
Watts connected load—15 kilowatts.
Control—3-heat control on each unit.
Number of heating units—Four.
Temperature to be maintained—500 to 600 degrees Fahrenheit.
Cycle of heating operations—Used for about 2 hours, 3 days each week.
Duration of process—Above 50 minutes.
Maximum demand—15 kilowatts.
Number of hours operated per day—Average 1 hour per day.
Diversity factor—See attached load curve which is a composite curve for 6 days (also connected load).



COMPOSITE CURVE MADE FROM SIX DAILY CURVES AT BURNETT SANITARIUM, FRESNO

Sum of all highest daily peaks, 140 kw.
Average daily peak, 23.3 kw.

Equipment installed:
General Electric hotel type range	15.5 kw.
Simplex hot plate	4 kw.
3 Hughes hot plates (3.3 kw. each)	9.9 kw.
Hughes hotel type toaster	3 kw.
General Electric domestic range	8 kw.
Total	40.4 kw.

Advantages over other fuels—Ease of control. Cost of fuel in direction proportion to output. Greater comfort in cooking quarters. Absence of smoke, dirt and dust. Cheaper than other fuels in this locality.
General discussion—More uniform results in cooking. Less shrinkage of food.

Data on Electric Cooking in a Sanitarium

Name of firm—Burnett Sanitarium.
Location—Fresno.
Name of appliances—1 hotel type range; 1 domestic range; 1 hotel type toaster; 4 hotplates.
Manufacturer of appliances—Hotel type range and domestic range made by General Electric; 3 hotplates and hotel type toaster made by Hughes Electric Heating Company; 1 hotplate made by Simplex Electric Heating Company.

Don't give the Kaiser a half-baked bomb — BUY A LIBERTY BOND

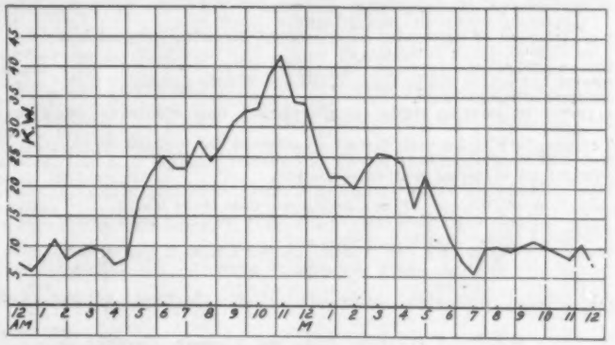
Construction of apparatus—General Electric and Simplex equipment of enclosed type units. Hughes equipment open type units. Made of metal and terra cotta brick. Hotel type toaster made entirely of metal.
Size—General Electric hotel type range, 61 in. high, 48 in. wide, 39½ in. deep. Hughes toaster, 22½ in. wide, 24 in. deep, 15 in. high. General Electric domestic range, floor space 24 x 45½ in., height 57½ in. Simplex hotplates 14 x 14 x 6 in. Hughes hotplate, 14 x 32½ x 6½ in. high.
Shape—General Electric hotel type range, rectangular. Hotplates of usual hotplate construction. Toaster, square. Domestic range of usual cabinet type, oven on the side.
Watts connected load—Hotel type range, 15½ kilowatts. Domestic range, 8 kilowatts; 3 Hughes hotplates, 3.3 kilowatts each. Simplex hotplate, 4 kilowatts. Hotel type toaster, 3 kilowatts.
Control—All units have 3-heat control except those on the hotel type range, which is equipped with 2-heat control on all oven units and single heat control on top hotplates.
Number of heating units—Hotel type range has 16, domestic range, 6. Hughes hotel type toaster, 2. Hughes hotplates, 3 (1 each). Simplex hotplate, 1.
Temperature maintained—Temperature on all above units varies from 250 to 600 degrees.
Cycle of heating operations—Hotel type range is used constantly from 5 a. m. to 6 p. m. Hotplates, domestic range and toaster used from 1½ hours to 2 hours during each meal.
Operation—All equipment hand controlled.
Maximum demand—Twenty kilowatts.
Number of hours operated per day—Main range operated about 12 hours a day. Hotplate equipment installed in diet kitchen operated about 5 hours a day.
Load factor—6.2 per cent.
Diversity factor—See attached load curve which is a composite curve for six days (also connected load).
Number of kilowatt hours per month—4500 kilowatt hours per month.
Amount of work done per month—Entire cooking for about 200 people.
Number of kilowatts per unit of product—No data available.
Advantages over other fuel—Absence of heat, smoke, fumes, dirt and dust. Ease of control. Better quality of work. More reliable in the exactness of results.
General discussion—In the first place, the hospitals equipped with electric cooking equipment are assisting materially in the conservation of our fuel supply where the electric energy is generated by water power. The advertising feature is an advantage to the institution. Meats cooked in the electric ovens shrink less, retain more of their nutritious juices, and enable the cook or the chef to turn out their work with less worry and fatigue.

Data on Industrial Electrical Cooking in a Hotel

Name of firm—Weit's Hotel.
Location—Wasco, California.
Name of appliance—1 range, 1 frying griddle, 1 electric water heater.
Name of manufacturer—Range is a General Electric, Type K-65. Frying griddle, Hughes Electric Heating Company. 3 kilowatt water heater, Automatic Electric Faucet Company.
Construction of apparatus—General Electric, enclosed type units throughout. Frying griddle, enclosed type. Water heater, electrolitic circulating automatic type installed on 30-gallon tank.
Size—General Electric range, 28¼ x 62 x 65 in. high. Frying griddle, 20 x 20 x 10 in. high. Water heater, 6½ x 4 x 11 in. high.
Shape—General Electric, 6 burners, 2 ovens, cabinet type. Frying griddle, square as per dimensions above. Water heater, tubular as per dimensions above.
Watts connected load—Range, 14 kilowatts. Frying griddle, 3 kilowatts. Water heater, 3 kilowatts.
Control—All range units and griddle units have 3-heat control switches. Water heater is controlled by an automatic thermal switch.
Number of heating units—The range has 10; frying griddle, 1; water heater, 1.
Temperature to be maintained—Range, 250 to 600 degrees; frying griddle, 250 to 600 degrees; water heater, about 190 degrees, Fahrenheit.
Cycle of heating operations—Range is used 3 times a day for about 3 hours each. The frying griddle also used 3 times a day, 3 hours each. Water heater works intermittently, due to the automatic control, for about 12 hours a day.
Weight of material heated—Range and frying griddle, food for about 35 people 3 meals a day. All hot water necessary for kitchen use heated by the water heater. No data as to number of gallons.
How material is handled—By hand.
Operation—By hand, except water heater, which is automatic.
Maximum demand—Ten kilowatts.
Number of hours operated per day—9 to 12 hours.
Load factor—2.8 per cent.
Diversity factor—See attached load curve which is a composite curve for 6 days (also connected load).
Kilowatt hours per month—2150.
Amount of work done per month—The cooking of about 3000 meals.
Number of kilowatts per unit of product—Seven-tenths kilowatt per meal.
Advantages over other fuels—In this locality much cheaper; is also cleaner, quicker, more reliable, and more satisfactory from every standpoint.
General discussion—More uniform results in cooking.

Data on Electric Spot Welder

Name of firm—Rudgear, Mearle & Co.
Location—198 Bay street, San Francisco, Cal.
Name of appliance—Spot welder.
Manufacturer of appliance—Toledo Electric Welding Co.
Size—5 ft. high by 5 ft. long.
Shape—Like an ordinary lathe.
Watts connected load—Thirteen kilowatts.
Control—Hand control.
Number of heating units—Three (adjusted for different weights of material).
Temperature maintained—1500 degrees C. 2700 degrees F.
Cycle of heating operation—
Weight of material heated—About one ounce.
How material is handled—Tubes set in vise by hand.
Duration of process—About 5 seconds to each weld.
Operation—Lowering welding pin by hand (extremely simple).
Maximum demand—Thirteen kilowatts.
Number of hours operated per day—Nine hours per day.
Load factor—4.6 per cent.
Diversity factor—None.
Number of kilowatts per month—405 kwh.
Amount of work done per month—Caps welded on about 5000 tubes per month.
Number of kilowatts per unit of product—81 watts per tube.



COMPOSITE CURVE MADE FROM SIX OTHER COMPOSITE CURVES OF COMMERCIAL COOKING INSTALLATIONS

The sum of the average peaks from the above six curves, 70.9 kw.

Hockheimer & Company, Bakersfield	10 kw.
Burnett Sanitarium, Fresno	40.4 kw.
Universal Packing Company, Fresno	15 kw.
Ideal Cafeteria, Fresno	7.6 kw.
Liberty Market, Fresno	26 kw.
Valley Grill, Fresno	10 kw.
Total	109 kw.

Advantages over other fuel—Advantage over acetylene welding: much more practical in every way, easier to handle; output probably double; less expensive to operate; maintenance cost very much less. Mr. Trost, engineer, is extremely satisfied with work of electric welder, and stated that the advantages over any other form of welding for this particular line are so many that he could not begin to name them.
General discussion—These people have six of these welders installed, and are very enthusiastic over their performance.

Data on a Ferro Silican and Manganese Furnace

Name of firm—Pacific Electro Metals Company.
Location—Bay Point, California.
Name of appliance—Ferro silican and manganese furnace.
Manufacturer of appliance—Pacific Electro Metals Company.
Construction of apparatus—Brick with carbon lining.
Size—6 ft. by 12 ft. by 4 ft. deep.
Shape—Rectangular—top open.
Watts connected load—3000 kilowatts now; 7000 kilowatts ultimate.
Control—Thury Automatic Current Control supplemented with hand control.
Number of heating units—Three.
Temperature maintained—2800 degrees to 3000 degrees F.
Cycle of heating operation—Charged and tapped about every hour.
Weight of material heated—15 tons per 24 hours.
How material is handled—Roller-bearing push car and elevator.
Duration of process—Continuous.
Maximum demand—3000 kilowatts now; 7000 kilowatts ultimate.
Number of hours operated per day—Twenty-four.
Load factor—Ninety per cent estimated.
Diversity factor—One.
Number of kilowatts per month—1,971,000 kilowatt hours.
Amount of work done per month—400 tons.
Number of kilowatts per unit of product—4900.
Advantages over other fuel—No other way to attain high temperature on such a large scale.
General discussion—This installation is not in continuous operation yet. Supplied from a 22,000 volt, 3-phase line, which taps the 100,000 volt transmission line.

Data on Water Heating Installation

Name of firm—Napa Soda Company.
Location—Napa Soda Springs, Cal.
Name of appliance—Bottle washing machine.
Manufacturer of appliance—Michael Yundt Co., Wilwaukee, Wis.
Construction of appliance—Tank with endless chain arrangement for carrying bottles through the water.
Size—Approximately 10 ft. high by 7 ft. x 7 ft.
Shape—Rectangular.
Watts connected load—16 kw. connected load.
Control—Thermal control, started with time switch.
Number of heating units—Two heating units.
Temperature to be maintained—125 degrees Fahrenheit.
Cycle of heating operation—Operates approximately 13 hours per day.
Weight of material heated—Approximately 8000 lbs. water.
How material is handled—Water is kept hot.
Duration of process—Bottles washed continuously for 10 hours per day.

You've got to make the voltage high enough to be effective — BUY A LIBERTY BOND

Maximum demand—Sixteen kilowatts.
Load factor—Fifty-five per cent.
Diversity factor—One hundred per cent.
Number of kilowatts per month—Average 4300.
Amount of work done per month—8000 to 10,000 bottles washed per day.
Advantages over other fuel—Convenience, safety, cleanliness and absence of all attention.

Data on Electric Furnaces

Name of firm—Enterprise Foundry Company.
Location—South San Francisco, Cal.
Name of appliance—Electric furnace.
Manufacturer of appliances—Enterprise Foundry, furnace; Allis-Chalmers Company, transformers.
Construction of apparatus—Brick-lined furnace, encased in brick.
Size—Three 1-ton furnaces.
Shape—Regular.
Watts connected load—350 kva. each. Single-phase.
Control—Transformer.
Number of heating units—Single-phase, one electrode each furnace.
Temperature to be maintained—Sufficient for melting steel.
Cycle of heating operation—Four hours.
Weight of material heated—One ton.
How material is handled—Ladles from furnace.
Duration of Process—Three heats per day of 24 hours.
Load factor—Approximately 50 per cent monthly load factor.
Diversity factor—1.5 per cent.
Number of kilowatts per month—130,000 kilowatt hours per month.
Number of kilowatt hours per unit of product—1200 kilowatt hours per ton.
Advantages over other fuel—Application of heat control and cheaper.

Industrial Heating Data on Electric Furnace

Name of firm—Llewellyn Iron Works.
Location—Torrance, Cal.
Name of appliance—Electric furnace.
Manufacturer of appliance—Home-made.
Construction of apparatus—Standard Heroult type 3-phase.
Size—Three-ton.
Shape—Circular.
Watts connected load—750,000.
Control—Automatic motor control.
Number of heating units—One furnace.
Temperature to be maintained—2800 degrees.
Cycle of heating operation—Four hours.
Weight of material heated—6000 pounds.
How material is handled—Manual labor.
Duration of process—Four hours on steel.
Operation—For own use only.
Maximum demand—750 kw.
Number of hours operated per day—Occasionally.
Load factor—About 85 per cent when in action.
Advantages over other fuel—Quality.

Industrial Heating Data on Electric Furnace

Name of firm—Union Tool Company.
Location—Torrance, Cal.
Name of appliance—Electric furnace.
Manufacturer of appliance—Home-made.
Construction of apparatus—Standard Heroult type, 3-phase.
Size—One ½-ton and one 1-ton.
Shape—Circular.
Watts connected load—225,000 and 750,000.
Control—½-ton, motor control, manual; 1-ton, motor control, automatic.
Number of heating units—Two furnaces.
Temperature to be maintained—2800 degrees.
Cycle of heating operation—Four hours.
Weight of material heated—1000 pounds and 2000 pounds.
How material is handled—Manual labor.
Duration of process—Two hours on ore and four hours on steel.
Maximum demand—225 kw. and 750 kw.
Number of hours operated per day—Fourteen hours.
Load factor—About 85 per cent during operation.
Number of kilowatt hours per month—½-ton, about 80,000; 1-ton, about 200,000.
Advantages over other fuel—Quality of product.
General discussion—More furnaces to follow.

Industrial Heating Data on Electric Furnace

Name of firm—Warman Steel Castings Co.
Location—Vernon, Cal.
Name of appliance—Electric furnace.
Manufacturer of appliance—Home-made; Heroult type, 3-phase.
Construction of apparatus—Special fire brick.
Size—Two-ton capacity.
Shape—Rectangular.
Watts connected load—1,200,000.
Control—Remote motor driven control.
Number of heating units—Two furnaces.
Temperature to be maintained—3000 degrees each.
Cycle of heating operation—Continuous.
Weight of material heated—Two tons.
How material is handled—Crane.
Number of hours operated per day—Twenty-four hours, one furnace.
Advantages over other fuel—Clean, convenient, better product.
General discussion—Very well satisfied.

Industrial Heating Data on Electric Brooders

Name of firm—Theo. Nehemed.
Location—Lennox, Cal.
Name of appliance—Chicken brooders.
Manufacturer of appliance—Artesia Electric Hatching Co.
Construction of apparatus—Microme wire and timber.
Size—4 ft. x 12 ft.
Shape—Rectangular.
Watts connected load—2000.
Control—Thermostatic.
Number of heating units—About 20.
Temperature to be maintained—90 degrees Fahrenheit.
Cycle of heating operation—Continuous 2 weeks.
Weight of material heated—Air.
Duration of process—Hatching season.
Operation—Continuous.
Maximum demand—2000 watts.
Number of hours operated per day—Twenty-four.
Load factor—One hundred per cent.
Diversity factor—Sixty per cent.
Advantages over other fuel—Even temperature, pure air, no danger.
General discussion—Well satisfied.

Industrial Heating Data on Electric Furnace

Name of firm—American Alloy & Chemical Company.
Location—Vernon, Cal.
Name of appliance—Electric furnace.
Construction of apparatus—Three-phase.
Size—One-quarter ton.
Watts connected load—150,000.
How material is handled—Manual labor.
Duration of process—Miscellaneous—ore tests.
Maximum demand—150 kw.
General discussion—Experimental for ores.

Data on Heating Installation at the California and Hawaiian Sugar Refining Company

An installation at the plant of the California and Hawaiian Sugar Refining Company, at Crockett, Cal., consists of automatic control electric heaters, for the purpose of maintaining a constant humidity. It seems that this company has been experiencing considerable trouble with powdered sugar. When it was packed in boxes containing too much moisture the sugar cakes. Therefore, they decided to endeavor to put the boxes in such shape that this trouble would be eliminated, and we understand that they have succeeded perfectly. It seems that the saturation point of the atmosphere varies with the temperature, therefore they can maintain a constant percentage of humidity by merely changing the temperature. The equipment consists of twenty-two 500 watt units, 110 v. each. These are connected three-phase, star, so as to balance the load on the three-phase distribution system. They are controlled by a hygrostat with relays, they in turn opening and closing the heater circuits. This apparatus is installed in a room 111 feet long by 40 feet wide, with a ceiling height of 10 feet. One wall is exposed to the bay and the other walls are partitions between rooms. The floor is fairly tight and the roof and ceiling sheathed with roofing paper. They are maintaining a humidity of approximately 55 per cent, and so far the maximum demand has been 30 kilowatts. This is a very interesting installation and it seems to have opened an entirely new field. The apparatus was designed and manufactured by the Electric Sales Service Company, of 109 Stevenson street, San Francisco.

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It doesn't pay to turn off the current until the operation is finished — BUY A LIBERTY BOND

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You've got to have money to run any business — BUY A LIBERTY BOND

BUSINESS BUILDING
SELLING IDEAS
DISPLAY

WITH THE ELECTRICAL CONTRACTOR AND DEALER

CONSTRUCTION KINKS
COST KEEPING
ESTIMATING

(If your customer doesn't get just as efficient service in your absence as when you act as salesman yourself, you can't afford to hire your clerks. The question still remains, of course, how efficient service you are capable of giving yourself. The discussion of sales methods and problems, as well as the best methods of advertising, presented here as a portion of a report drawn up by H. F. Allen, E. B. Criddle, H. A. Lemmon, M. L. Scobey and L. H. Newbert, will undoubtedly form one of the most entertaining as well as instructive parts of the convention proceedings. It constitutes one division of the Commercial Committee's contribution—Pacific Coast Section, N. E. L. A.—The Editor.)

SELLING METHODS

There are few electric dealers who cannot learn something from the sales methods adopted by the modern department or dry goods store. Their seasonal sales, their purchases of stock, the training of their salespeople, their window displays, their advertising, have all been reduced to such fine art that guesswork as to results has almost been eliminated. A careful study of their system cannot but be an inspiration to any retailer and with a little thought many of their methods can be adapted to electrical merchandising.

For instance, all their special sales are laid out months ahead, the window and store display is arranged, and advertising done, the goods ordered to be delivered at the proper time, and such arrangements regarding price fixing made that it is practically certain that no goods will be felt on hand which would have to be sold at a loss.

Advantage is taken of every season, every holiday and every event of importance, in fact it is almost true that there is no longer a dull season in the dry goods trade, an artificial demand has been produced at periods when business, under normal circumstances, would be dull.

With a little thought, and more forethought, it should be possible for the electrical dealer to develop his business along the same lines. In fact it should be possible for him to select appliances which would to some extent tie in with the goods advertised for their seasonal sales by the large department houses, and hence reap some advantage from their advertising by tying in his advertising and window displays with theirs. For instance, during their March sale of materials and hardware used in house cleaning, he might strongly advertise and attractively display vacuum cleaners and washing machines.

Again, February is generally recognized by the dry goods stores as the month in which to push dressmaking goods and sewing necessities. This might be utilized to make a special effort to sell electric sewing machines, sewing machine motors and electric irons.

These instances might be extended to cover every month in the year; in fact, almost every week; and there is no doubt that by thoughtfully taking advantage of the educational work in promoting "out-of-season" sales, conducted by the large dry goods stores, that hundreds of appliances that now lie in their stores merely on display might be sold by the electric dealers.

Christmas time should be as profitable a time for the electric dealer as it is for the retailers in other lines. The electric appliance is an ideal Christmas gift, combining, as "it usually does," attractive appearance with year-round usefulness, and it may truly be advertised that no gift gives such lasting pleasure or recall so often thoughts of the giver. Don't be afraid to advertise Christmas stock; a great majority of Christmas presents are bought through press advertising and attractive window displays.

The successful dealer must remember that just as people will not buy electric fans in mid-winter, they will buy the right appliance displayed at the right moment. It is up to him according to his locality and climate to judge the right appliance for the right moment and take advantage of the other retailers' advertising.

It should be the endeavor of the dealer to know every one of his customers by name, to become acquainted with the subjects which are of special interest to them and, above all, to make them glad to come in and see him, if only for a chat. In his dealings with his customers they must be right, however unreasonable their demands. Marshal Field built up his huge business on this principle and it is recorded of him that on one occasion he refunded money to a customer on an article which he had never carried in stock, but which a customer insisted she had bought at his store.

Before antagonizing a customer in case of complaint, even if you know him to be wrong, figure what his future custom may be worth to you. Just as a soft answer turneth away wrath so does a graceful concession on the part of the dealer secure the ultimate friendship of a complaining customer.

Not only should the successful dealer know all his customers by name, but he should have a list of them, and if his treatment of them has invariably been courteous, they may even welcome a telephone call from him during, say, the vacuum cleaner and washing machine sale in March, offering one of these machines on approval for 24 hours, with a brief but plain explanation of the selling price and terms.

The girl at the telephone must answer inquiries of all kinds with intelligent interest. She must not merely give the desired information, but she must take pains and trouble to handle it as though it were her

Even success in business wouldn't be worth much without success in the war—
BUY A LIBERTY BOND

best friend at the other end of the wire.

Courteous treatment and a genuine interest in customers or prospective customers pays, as the following incident will prove:

A firm had been advertising a suction cleaner. A lady who had read the ad 'phoned in for additional information, and this was the answer she received from the girl who answered the 'phone:

"Well, Mr. Brown isn't here. No, I don't know when he will be back. What? Oh, they are forty dollars."

The lady at the other end of the wire said "thank you," and called up another dealer. The girl in his shop answered thus:

"Mr. Smith has just stepped out for a moment. I will be very glad to give him a message. Vacuum cleaners? Yes, indeed, and a vacuum cleaner is just simply a wonderful thing. Unless you have used one you can't imagine the tremendous amount of work they save. There is one in my home and we wouldn't think of doing—but I am not going to spoil your pleasure and surprise by telling you about it. I am going to ask Mr. Smith to take one out to your home and have you try it—and let you be the judge. He will be glad to do so. Oh, that doesn't matter—whether you buy ours or not. There are several good makes. We will be glad to clean one room for you—from the ceiling to the floor," and she gets the name and street number.

Now, this is perhaps a small thing, but which house do you think landed the order? These small things are just the difference between success and failure.

Perhaps the dealer says he cannot afford a girl who has tact and knowledge to reply as she should during his absence. He is mistaken; he cannot afford one who can't. And this spirit must prevail throughout the establishment and include the proprietor. No visitor must be allowed to depart without feeling that it was a pleasure to call.

Doubtless one of the most vital points of interest to the contractor-dealer is the matter of window dressing, or rather window display.

Unfortunately it is one on which perhaps the fewest recommendations can be made, for much depends on what each individual dealer has in stock than can be displayed.

However, there are one or two recommendations that can be carried out regardless of what is being displayed or what is on hand for display purposes.

I believe I am safe in saying that there is not a dealer in the state who cannot put in a good display of Mazda lamps and any window would be appropriate at any time of the year.

Another item for display is flatirons, also acceptable at any season and an article practically always carried in sufficient quantities by dealers so that an attractive window can be made up.

The object of the window display is to attract attention to the store and this may be done by having a specially priced article on sale. But that is not likely to be the case with an electrical contractor, because his margin of profit is so small that it will not permit of cut prices.

Another means would be to have some new novelty or something not shown elsewhere in the city, but that, too, is unlikely to happen in the electrical business.

Yet another way is to have something alive, or moving, in the window, and that is where we shine, because we all have a motor of some sort that can be fixed up to run some sort of animated window display.

Whenever possible, have something of that nature in your windows, and it will arrest the public's attention.

It will be surprising to note the attention attracted to a window where such a simple thing as a mother cat and kittens are displayed, a rubber ball being blown about by an electric fan, or a bowl containing goldfish, to say nothing of the more complicated devices that can be connected to a small motor.

Just two more points I wish to impress on the dealer with regard to window display, and they are:

First—Don't display such material as loom, condulets and other wiring material, because the public does not know what they are, or if they did happen to know about them, they certainly are not interesting or pleasing to the eye.

Second—When making a display of irons, don't try to fill the window. A few will answer the purpose and look far better, to say nothing of the saving of work.

If displaying toasters, put in one or two percolators with a card suggesting that toast and coffee made

A DOUBLE ADVERTISEMENT

A circular band of advertising which is being stitched by this electric machine provides a double attraction for the window of the Sigwart Electric Company of Eugene, Oregon. The moving band calls attention both to the ease with which the machine is running and to the advertising items which go to make up the rotating strip of cloth.

They gave up their business to enlist—BUY A LIBERTY BOND

electrically are an aid to appetite and digestion.

Don't crowd your windows and try to put something of every line you carry in the window, because people in passing do not get any one definite impression.

SEVEN SALES POINTS

Tie in with the department store advertising.
Take advantage of Christmas opportunities.
Maintain pleasant relations with customers.
Cash in on telephone orders.
Provide effective window displays.
Choose your salesmen to represent YOU.
Keep your selling force educated as to your stock.

The average mind has a well formulated sense of balance and color. Care should be taken in every display that whilst the colors harmonize, the goods displayed are in sufficient contrast to attract attention to them rather than to the background whilst the main center attraction in the display should be so placed in reference to the remainder of the display that the whole is in correct proportion. A careful study of well displayed windows will do more to teach the art of window dressing than a volume of description.

The manufacturers are supplying live dealers with attractive cards and window display material, and when properly used they are a great help in getting the business.

The Salesman

The salesman is YOU, he is not an employee drawing down so many dollars per week and producing so much revenue for it, but he is to the customer the embodiment of you or your company. Is he a worthy representative? Are you paying him enough money to be a worthy representative? Have you taught him enough about your business to make him an efficient representative?

The three points about a salesman that appeal to a customer are neatness of appearance, courtesy, knowledge of his business, and without one of these attributes no salesman can be a success.

To consider them in the order named:

Appearance

The salesman's or saleswoman's appearance should be neat and tidy, and above all, clean.

It doesn't cost anything to have clean hands and finger nails, hair well combed and clothes brushed, and every woman is sure to notice and approve of the one who is neat in appearance. I can assure you they would not go the second time to any of our large stores where clerks were allowed to be untidy, or coatless, or where clerks were permitted to smoke or chew gum or tobacco while waiting on lady customers.

A pleasant, smiling countenance is an absolute necessity in a good salesman or saleswoman. The next time you enter a store in which there is one real pleasant looking salesperson amongst several who are wooden-faced or grouchy-looking, watch to which person customers flock, and what is more important, notice which makes the greatest number of good sales. Of course it is the pleasant appearing one, all the time.

Again, remember that to the customer your salesman is you, and if they obtain an unpleasing impression from the appearance of the salesman on making their first entry of that store it is possible that this impression may outlast all the good service you may render and bring all your advertising and display work to naught.

Courtesy

If the last paragraph applies to appearance, doubly so does it apply to courtesy. There is never, and never can be, any excuse for a discourteous word or gesture from a salesman to a customer. If a customer becomes so unreasonable that the salesman cannot handle the matter he should still courteously refer the customer directly to the dealer, explaining that a settlement of the complaint is in this case outside his province.

A good salesman will never allow the customer to speak first, but approaching her politely, will say "Good morning," and if after a slight pause the customer still fails to indicate her wishes, he will say, "Can we do something for you this morning," never a terse "Something for you?" of the five and ten-cent store. When he has sold the customer the goods she came in for he should politely and without any appearance of trying to force a sale, point out the line which is being specially pushed at that time, or some line in which he thinks the customer would be interested. If she shows the slightest interest he will immediately display the appliance in operation and explain its advantages fully.

When the customer is ready to leave the store she should, if time permits, be conducted to the door with a polite "Good-day, Mrs. Jones."

Women are particularly susceptible to courteous treatment, and other things being equal, it will influence their patronage of any particular store. By the courteous, diplomatic handling of a complaint, a good salesman can actually turn the cause for complaint into a good advertisement for the store.

Knowledge of the Business

Do your salespeople know all they should of the advantages to the customer of the appliances carried in stock? Can they tell a customer instantly why one article is slightly higher in price than another? If they do not know these things, it is certain that they cannot create in the customer that desire to buy that must be the prelude to the making of a sale.

You, personally, had some reason for buying a certain line of goods from a manufacturer. It might be that there was some particular advantage in the appliance selected which competing appliances did not possess. It might be that a specially low price was offered, and it is to be presumed that you are willing to give your customers the advantage of this low price. Have you told your salesmen why you made this purchase in order that they can explain to the customer its particular advantages either of quality or price?

Honesty in salesmanship and advertising is essential in modern business. Every misstatement or misrepresentation is certain to ultimately recoil on the head of him who makes it. But if your salesman does not know, your advertising writer does not know, they will almost certainly at some time make misstate-

An oversubscribed loan is the best sort of advertising to impress the Kaiser—BUY A LIBERTY BOND

ments out of very enthusiasm, and they can scarcely be blamed.

Immediately any new appliance is put on display call all your staff together, even the delivery boy, and explain fully its operation, its advantages, why it is worth the money asked, and the terms of payment on which it may be sold. This should be an invariable rule never to be neglected.

When a manufacturer's salesman comes into town, let him explain to your staff the advantages of the lines he has sold you. He will be glad to do it and feel more inclined to recommend the closer co-operation of his firm.

See that the central station representatives are fully aware of the lines you handle, their advantages and selling cost. They too will be only too glad to co-operate in the sale of appliances which mean an added load on their lines.

For some reason saleswomen are to be preferred to men in the electric dealer's store, particularly at this time when a shortage of male labor is rapidly developing. As already stated, the greater number of the appliances sold are for use in the home, which is essentially the woman's sphere, and a woman customer is more apt to be impressed by a saleswoman's demonstration of an appliance which the customer is herself to use than if the demonstration were made by a man. As a matter of fact, the average man feels self-conscious in demonstrating such appliances as electric curling tongs, hair driers, washing machines or sewing machines, and is not, therefore, at his highest selling efficiency.

The good electric salesman or saleswoman will make a study of the development and manufacture of the goods sold. For instance, he or she should know something of scientific illumination, something of art as applied to fixtures and their relation to various styles of decoration. Something as to the correction of troubles in appliances sold.

The dealer should see that the trade papers and manufacturers' literature are available for the use of salespeople, and they should be instructed to read specially interesting articles or advertisements.

Finally, again remember that you and your business will largely be judged by the appearance, courtesy and knowledge of your salespeople, and every point mentioned above requires careful thought and study if real success is to be attained.

ADVERTISING

The Amount That Can Profitably Be Spent on Advertising

Press advertising is almost essential to the successful retailer of today. People, and particularly women, have been educated to closely watch the advertisement column of the daily and weekly papers, and a very large proportion of their buying is done from the announcements in these columns. The dealer who fails to advertise, therefore, fails to secure much of the business which goes to his competitor or is directed into other channels.

This does not mean that the dealer should rush into print with full page advertisements, for careful investigations have shown that except under very unusual conditions 4 per cent of the total revenue from sales is the maximum expenditure which will secure profitable returns, and taken over the year this amount should not be greatly exceeded.

You purchase goods because you desire the goods more than you desire the money which they cost.

If you think more of the money you keep it and the other fellow keeps his goods. Therefore, an advertisement to be successful must impress the reader and stimulate his imagination to desiring the goods. He must not only desire them, but desire them more than the money they will cost.

Now we must consider that electric appliances—however desirable they may be—are not as essential to the household as is clothing or food, for example. Therefore we must excite our prospects' imagination, or in nine cases out of ten we will make no sale. He must imagine a condition which makes our devices very desirable.

First of all Mr. Dealer must determine whether his newspaper advertising will attract customers to his store, or whether it will prepare them for a call from his salesman, or a combination of both. Of course we all would be overjoyed to be able to write advertisements which would fill our shops with eager customers, and let it go at that. Unfortunately, however, a newspaper advertisement is not magic. This happy result can be accomplished with some kinds of goods—principally the staples. For example, there is no question a mere announcement that a certain grocery firm in our city will sell Gold Medal flour at one dollar per hundred pounds will result in a riot of purchasers, because every household must have flour, and each knows it is worth six or seven dollars. But the announcement that you will sell seven-dollar percolators for six dollars will not tax the energy of the police reserves.

We are all interested in this war. Most of us are more interested in it than we are in any other thing. If I were to advertise that I would come to this city and deliver a lecture on the war there wouldn't be enough people in the audience to smother the echoes of the theatre. If, however, General Pershing or President Wilson should fill the engagement, it would overflow. Now, in all probability I could quite easily get a speech writen for me that in every way would be equal to President Wilson's but that would not alter things at all. One's interest and imagination could not be aroused. I could fill the theatre, however, if in connection with my speech, I advertised that some well-known vaudeville performers would appear with me, and the entertainment would be free. Having brought you into my theatre I could get your attention and your interest in my message—if I really had one to deliver.

So the dealer must not believe that he can construct an advertisement along legitimate lines which

You've got to follow up your first volley with a second — BUY A LIBERTY BOND

will pack his show rooms. He must introduce the vaudeville feature to get his people inside his doors, and then his ingenuity will supply means of interesting them in the things he desires. A common form of

If she has her mind fixed on something else, she may walk right past your store without noticing even the most attractive advertisement. It is not necessarily the day when most people are down town, for instance, that is best for your demonstration — they may be intent on the week's marketing and not have time for you.

business vaudeville—showing the device in operation, is a demonstration. It doesn't matter so much what kind—his own wife can tell him what kind will attract attention. If he decides upon this form his advertising should have very little to say about appliances; just a few concrete sentences regarding the particular result he is going to demonstrate.

Having arranged the stage setting in our show rooms for the demonstration, and having advertised it properly, we still have but fairly started. First comes the selection of the day or days in the week, and much will depend upon our wisdom in this respect. Probably in a large city we would be told to select Tuesday, or Thursday (or some other day) because ladies generally either stay at home that day, or do not stay at home, whichever the case may be. However, as a matter of fact, that may have no bearing whatever. Information from the department store may disclose that more ladies are on the street Saturday than on other days. On the other hand, further consideration may lead us to the conclusion that the day on which the greatest number of ladies come down town may not be the best for our purposes after all. They may come down for some special purpose, and consequently it may be difficult to divert them from their preconceived program; or they may not come in the right frame of mind; or the day may be one on which the particular class of people we wish to attract may stay at home. We must determine these things based on local conditions and community habits, and we must determine them correctly.

This method of advertising, however effective it may be, has its limitations. For example, it cannot be used many times during the year, and unless very skilfully handled, is dangerous.

So we will pass it up and go on to a consideration of an advertising campaign which contemplates a combination of both store and home-sales.

First, to whom are we likely to sell our goods; in my own mind I am satisfied that over 90 per cent of our sales are made either directly or indirectly to women. If I am right our advertisements must be written for women. Columns have been written regarding the relative merits of morning and evening newspapers as advertising mediums, and they all sound good. Personally, I would be more interested in the character of the paper than in its hour of publication. Next comes a consideration of the space to be used. This also depends, in my opinion, almost entirely upon the size of the general run of ads in the paper selected. A quarter page of the Journal of Electricity, for example, would be of sufficient size to attract attention. The same space in square inches would not be nearly so prominent were it compelled to compete for attention in a section of a large newspaper devoted to half and full page department store announcements. In the average four-page country newspaper, single column 4 inch, is a desirable space, and a double-column 6 inch is quite a spread. It all depends upon what company our advertisement must keep.

While perhaps it has no bearing in this particular instance, it may be rather interesting to some to learn that a series of experiments with central station advertising in an average eight-page paper disclosed a number of peculiar psychological facts. One of them is that a one-fifth space is ordinarily more interest compelling than either a greater or lesser space. The reasons are perfectly plain, but not of sufficient importance to warrant a discussion herein. This is more space, however, than the dealer will be justified in using, at least until he is very sure of himself. However cleverly we design our ads, we must recognize the law of diminishing return, which is in effect that a dozen young ladies are not twelve times as beautiful as one; that collectively six men are not six times as intelligent as one; and that generally speaking a full page ad is not twice as valuable when measured by returns as is a half-page. Many ad writers believe firmly in the "little drops of water" theory and they tell you that

Don't blow up the church to get the man who killed your dog—he may stay home that Sunday to paint the floor. At-random advertising is apt to miss the very man who would buy your wares.

"steady, persistent, constantly-before-the-public newspaper advertising is the real thing," and they prefer a comparatively small space, but one which appears in every issue of the paper. If we are advertising appliances I prefer to use my advertising appropriation in a few brief smashes, and if I have but 50 inches at my disposal for any one month, I am far more likely to use

Write this ad in bold type all over the page—don't make the figures too small—
BUY A LIBERTY BOND

it all up in two or three issues than to spread it over all the days of the month. However that may be, the man who is writing ads soon acquires a style which indicates its own space. Personally, my ads are almost entirely one of two types—either very few words with lots of white space, or several hundred words—still with much white space. I find it very difficult to write anything in between these two extremes.

First of all, whatever you do, let your advertisement reflect your own individuality and personality. Don't attempt fine writing and don't attempt cute or humorous things. Don't attempt to write a section of the dictionary into your advertising; use words of as near one syllable as possible. Make it appear just like your every-day, commonplace conversation. After you have written it out read it aloud, or better still, have some one else do so. If it doesn't sound like you talk, change it until it does.

If you have many friends it is because of your personality, and if you haven't it is going to be hard sledding for you in a business of your own. Any successful competitive business is 10 per cent stock and 90 per cent personality. You can't use anyone's else. Use your own. And now let's just briefly touch the actual construction of an advertisement. We can of course rely upon the manufacturers of devices for advertisements in plate form, all ready for the newspaper. One thing in their favor is that they are properly displayed. Another is that they will be fairly good ads; but if you rely upon them you will be disappointed. And for just the reason outlined above. They present some other follow's personality. If Billy Sunday, for example, were to go into business for himself and use such advertising as Tiffany's jewelry store uses he would go broke in six months, and at that he probably would last as long as Tiffany's would if it hired Billy Sunday to write its ads. Each has a personality which is peculiar to the individual; so you have; and this is the great reason why you should generally avoid the "canned" advertisement. The ready-made ad may have character, but it isn't yours, and it is your character which you seek to cash in on—otherwise you are unwise to enter the business maelstrom.

Just for the sake of argument suppose we have determined that we will feature coffee percolators, and have decided upon the amount of space to be used. It ought to be obvious that it doesn't matter in the slightest how much space we buy or what we write to put in it unless we can get people to read it. We all read certain articles in our daily papers because their headlines attract our attention—in some subtle manner they appeal to our imaginations. We pass up other articles without even being conscious of having read the headlines, although as a matter of fact we have. They simply didn't whip our brains to any effort whatever. So we may reasonably conclude that the headlines of our ad must arrest attention and make a mental impression on our readers if they are to read what follows. We must excite interest. Now there are many devices to accomplish this. A favorite one is the introduction of a picture. Unfortunately this has been somewhat overdone on the whole, until the average reader passes pictures just as he does uninteresting headlines. This perhaps is largely due to the fact that many advertising pictures have no more character than have the canned ads. As it is impractical to hire a real artist to draw pictures for our ads, we must either do without them or use such as are available. In the latter case, be careful. Subordinate the picture instead of featuring it. Have them just sort of ornamental or incidental, as it were. A national advertiser at the present moment is running at the head of his advertisements historical pictures, such as Washingtong crossing the Delaware, etc., and endeavoring to tie these events into his desire to sell chewing gum, or whatever it is he is offering. Now I am interested in advertising and the advertising pages of magazines attract me first of all, and yet, after having seen a half dozen of those ads, I don't know to this day what thing it is that this fellow is advertising. In other words, the picture, if used, must fit into the advertisement and not introduce a subject or a line of thought entirely foreign to it.

You can get hundreds of these by going over your old stock of cuts which the manufacturers have furnished you and getting your printer to remove such portions of the plate as are not required. Personally, as a general rule, I do not believe in featuring a picture of the device itself. If I had to use one it would be very small and inconspicuous, and yet because most of the advertisements in the paper with which ours must compete for public attention will be plain type, it adds a certain attractive distinction to use a picture if possible. The next thing to a picture is white space. Use lots of it and pay for it cheerfully.

Laying Out the Advertisement

Do not trust to the newspaper compositor to lay out your advertisement, particularly if the paper is a small one. The lay out is to the advertisement what your window display should be to the appliances displayed and the finest copy in the world can be ruined by poor setting up.

Insist that the whole advertisement be set up in the same type face (in different sizes). A number of different type faces is confusing to the reader and creates a bad impression.

Emphasize only the heading and very important sentences in black face type or italics. Too much emphasis is no emphasis at all.

Select one type face and some distinctive type of lay-out for all your advertising and, having selected them, insist that you will only pay for advertisements that are set in this way and for which you have O. K.'d the proofs.

The ideal space for advertisements is of the same shape as that of display windows, that is length= 1 2/3 width. As the standard newspaper column is 2⅛ inches wide, the ideal spaces are:

1 column, 3½ inches.
2 column, 7 inches.
3 column, 10½ inches.

A most important consideration in laying out an ad is: Whose attention do we wish to attract? Perhaps we exclaim: "Why, everybody's." Unfortunate-

It's just as much your business as your store is—BUY A LIBERTY BOND

ly, it can't be done. For the reason that some of us prefer blonds to brunettes and others prefer blue serge to Scotch plaid suits, we simply cannot appeal to not alone everybody, but even to a very large percentage of our public in any one advertisement. Firing a high explosive shell into a crowded church just on the off chance of killing the man who shot your dog last week isn't efficient. Maybe he doesn't go to church, or if he does he may have missed this Sunday to stay at home to paint the kitchen floor. Instead of that, let's sit on his door-step and sandbag him when he does come out. It takes less ammunition and we get the desired results.

First, we must decide just what women we are going to appeal to—that is just what individual woman is repeated the greatest number of times in our community. Possibly we will conclude that the very wealthy do not offer a field that is likely to excite us to estimating future profits, and also we may conclude that the very poor are not likely to be so much interested in the means of making coffee as they are in getting the coffee to make. It would seem to me that our best field would be among those "just average" people, on the borderland, where about half of them rent and the other half own their own cottages; the husband receives from $100 to $175 per month.

It really doesn't matter in the least what class you determine on—that is in so far as the methods to be applied to writing the ad; we just change the appeal, that's all. If we have determined the class we are going after, we then must stop right there and get their viewpoint. We must place ourselves in their places, and determine to our own satisfaction what their great interest in life is, something about their family affairs and a good deal about their household arrangements. In other words, we must enter their home, or rather, imagine ourselves there.

Because we all are more or less alike, and because what is occurring in friend Jack Smith's home is occurring in many other homes, let's write our ad for Mrs. Smith. If the headline of our advertisement reads:

"MRS. JACK SMITH,
YOU MAKE VILE COFFEE."

The lady will read it and she'll probably call her husband's attention to it, and he probably will call yours, but that sort of an appeal has its disadvantage, although many of Mrs. Smith's neighbors and friends will secretly agree with you. As a matter of fact, however, each lady probably believes she makes better coffee than do her neighbors. She will agree with you that their methods should be improved. There is nothing that gives such confidence in the wise uncanny judgment of the speaker as for him to tell his audience something they already know or believe. So if we change that heading to read:

"YOUR FRIENDS
MAKE POOR COFFEE"

We will have combined two or three desirable elements. First, the word "your" is a personal message to every feminine eye which lights on it. Apparently it states an admitted fact and establishes your cleverness. It asserts something each lady has secretly chuckled over, and she wishes Mrs. Jones and Mrs. Brown, whose hospitality she has enjoyed on various occasions could read it and take it to heart. Of course, she herself has acquired the knack of making coffee that is famous, and she takes a satisfied interest and begins to wonder if Mrs. Jones and Mrs. Brown will realize that that ad is a personal message to them. So we have gained her interest, and having gained it, that half of the battle is over. Then, passing on to the body of our advertisement we perhaps begin with an alleged exclamation of disgust which a peevish husband or a tactless guest may have relieved himself or herself of when this poor coffee was sampled. And so on throughout we will continue our little lecture and innuendos, but always direct them at the neighbors and friends and not at the lady to whom the ad is addressed. It won't bring much excess profit tax to tell the lady herself that she has missed the art, but we can at the finish tell her how she can continue to make the excellent coffee for which she is famed, and do it in an easier, more attractive manner — the electrical percolator.

We tell her that this method will not interfere with the personal touch of the genuine artist, which she succeeds in infusing into her coffee, but rather will give her genius greater play, etc., etc., and then if we give free trials we will offer to send a percolator out to her for her judgment, which we are extremely anxious to have; or some other device which we may have invented to get a direct contact with her. The salesman who follows up this ad will take his text from it. There are many differences of opinion regarding

ATTRACTIVE PACKAGES

The neatness with which the package appears on delivery at the home has much to do with the second order and its placing. The Japanese package, wrapped in paper of many colors, and so arranged that the dealer's house and street number has a prominent place between the colored strings that bind it, have won the admiration of all beholders. The electrical contractor-dealer can, by proper care in sending out packages, build up a more profitable business by due attention to this little item of neatly and properly tieing up packages.

It's not mere money you are subscribing, but the food and ammunition and ships for the boys—
BUY A LIBERTY BOND

printing the price. If you are going to use figures bear in mind that the written appeal must be very strong or the dollar sign will kill the whole thing.

Suppose, on the other hand, we head our advertisement "Electric Coffee Percolators." There is no reason in the world why it should arrest attention unless the reader has already made up her mind to purchase one. And then starting in in that manner, many of us will go on with a statement that our percolator is valveless, or set forth some other mechanical feature. Now, the lady of the house doesn't care a whoop

This is just a suggestion of how impromptu occasions can be quickly met with complete satisfaction in the Electrically Equipped Home.

It is not the mechanical device you sell, but the picture which it raises in the customer's imagination. An effective advertisement which applies this principle.

whether the device is valveless or not. Her imagination is not excited by mechanical features. She is not even aware of their existence. Such an ad does not "promise benefits greater than the sacrifice" of seven dollars or whatever the price may be. Whatever blunders we may make we must bear in mind that we are not selling a device, but instead are selling the things a device will do in the home where it is installed.

The man who buys a fishing rod and a book of flies and plans weeks ahead, and goes out in the back yard and digs worms and feeds them coffee grounds isn't really intensely absorbed in a collection of worms, nor in colored feathers tied to hooks. What he has in mind all the time and what he is enjoying in anticipation, is a trip up into a cool of the mountains, the open air, babbling brooks, enjoyable lunches, congenial companionship, etc. In other words, the sporting house is not selling him a rod and fly book, but actually is selling him a trip into the country. It is selling him a picture of enjoyment and contentment which his own imagination paints. This is precisely what we must sell the ladies when we offer electric devices. Sell them a picture of pleasure, contentment, leisure, ease, etc. We don't endeavor to sell toasters, but we do sell companionship at the breakfast table.

One of the most effective—if not indeed the most effective—appeal to women is through their children. Any mother worthy the name will make untold sacrifices to bring happiness to her children. When your little girl climbs up and gets the toaster down off the pantry shelf and lugs it into the dining room and after a few futile attempts finally manages to get it connected, she probably is as serious as any cook ever was. Perhaps she will not slice the bread evenly—it is barely possible she will not even toast it evenly, and it seems to me one slice did fall on the floor as she almost stood up in her chair turning it; but her eyes were beaming with joyous pride at being able to help mama and in doing something for daddy, and you will have to admit no toast ever tasted better. Did you glance at the misses across the table to see what was in her eyes? No; well, if you had you would never need to ask what appeal to make to mothers to sell toasters; and then just put that incident on paper and you have an effective advertisement.

Another form of appeal is an apparently indirect one. The word "apparent" is used, but as a matter of fact it is decidedly direct. Our advertisement will apparently be directed to the husband. Perhaps it will start out in black type, "Are You Giving Your Wife a Square Deal?" and then likely you go on and tell Mr. Husband of his office conveniences and comforts and then contrast them with the methods his wife is forced to put up with just because of his thoughtlessness or lack of consideration. Now, ostensibly, that ad is for husbands, but many more wives will read it than will husbands, and most of them will recognize the picture as applying to themselves. Discontent is the basis of all sales. If we were contented with what we had we wouldn't purchase other things, and it is remarkably easy to make people discontented with existing conditions, whoever they may be, and it is just as easy to use this state of mind for our own legitimate purposes. If we abandon once for all that we are selling devices and preach to our employees and our readers and to ourselves that we are selling the things these devices will do, and assist people to paint the picture of what they will do for them in their own homes, we cannot go very far wrong from advertising the way it should be done.

There is another form of advertising which, if well done, is rather clever; and the whole scheme is negative. It bears the hallmark of approval of the greatest advertiser who ever existed during all time—the devil, or Mr. Satan, as perhaps he prefers to be designated. He pulled it on Eve and has pulled it on all of us ever since with what must be a very satisfactory result. And that is playing on our resentment of unreasonably imposed restraint. Now, Eve didn't have any special use for an apple. All the fruit trees and berry bushes were doing well, the season had been favorable and the San Jose scale was still confined to one small peach tree on the back lot. As a matter of fact, it is quite possible she might have lived a long and useful life without ever having noticed that apple tree. And then all at once the Master Advertiser, Mr. Satan, started something. He made that miserable tree stand out above everything in the whole garden by simply informing Eve that she must not under any circumstances eat apples. So then, of course, she immediately began hunting about for that apple tree, and asking every gardener she met where it was and getting all impatient because they had never heard of it, and

If it were your store on fire, you'd pay for the water gladly—BUY A LIBERTY BOND

getting all sorts of misinformation such as that apples grow on vines, etc., but persisting nevertheless until she found it, and then sitting down and rebelling at the prohibition and wondering why such an unreasonable order should be given, and crying because she was so abused and misunderstood by the world, and bemoaning that the only thing she wanted in the world was denied to her. But some of you probably have heard the story and there is no use going into details. But she finally got the apple. Now we disciples of that great advertiser use that same device in many ways. For example, if we should advertise that we have only two dozen of our percolators left; that when they are gone no more can be obtained; that we will not set any of them aside; but on Saturday morning we will sell them to the first people who ask for them, we would have a line formed in front of our shops two hours before we opened—that is, if we could really convince them in our ad that it is true they could not get others like them. People would be in that line who never thought of owning an electric percolator, or were not even actively aware of their existence, but they would resent the idea that they could not have them if they wanted them.

GETTEM & KEEPHAM
ELECTRICAL CONTRACTORS

Upsocummin, April 1 1921.

Dear Mrs. Smith,

You can take one of the lids off the kitchen stove, and, by holding a slice of bread on a fork near the fire, make good toast---if the fire is just right. If it is too hot your toast will be soggy in the center, and if it is not hot enough it will simply dry out; but experience will teach you so you will know when the fire is just right. Of course you will toast yourself at the same time you toast the bread; but a little ingenuity will overcome that; gloves will protect your hands and you can hold a newspaper in front of your face. It is true that you finish but one slice at a time and may get discouraged because the family devours it as fast as you are able to toast it, and you are unable to sit with them at the breakfast table, but this cannot well be avoided, as you well know that toast made in advance is not real toast. You also know that toast made on top of the stove or in an oven is not real toast either---that toast, simple as it seems, is one of the most difficult things to make properly.

There is another way. You sit at the table and enjoy the meal with your family, with your electric toaster before you, and make it,---two slices at a time---just as it is used. Delicious, golden brown, crisp, perfect toast---better than you have ever tasted before. The slices must stand upright to make perfect toast---there is a scientific reason.

Next to the electric toaster the best way is to take the lid off the kitchen stove. Which do you prefer?

Yours very truly,

Gettem & Keepham
per S. Will Gettem

A letter which actually brought results

Advertising as applied to electric devices, however, cannot perform miracles. If we are to get the full benefit of our newspaper space we must follow it up. It is one thing to instill a desire in the minds of our contemplated victims for that which we have to sell, but it is another thing to inspire them with the will to actually acquire them. Hence the necessity of follow-up campaigns. Much can be done with letters if the list to which they are sent is carefully selected, and the same principles apply to letter writing as to newspaper advertising. Don't start letters formally or stiffly, nor with descriptions of devices. I don't say that this letter is a good one—I only state that it sold toasters in connection with newspaper advertising:

Dear Mrs. Smith:

You can take one of the lids off the kitchen stove, and, by holding a slice of bread on a fork near the fire, make good toast—if the fire is just right. If it is too hot your toast will be soggy in the center, and if it is not hot enough it will simply dry out; but experience will teach you so you will know when the fire is just right. Of course you will toast yourself at the same time you toast the bread; but a little ingenuity will overcome that; gloves will protect your hands and you can hold a newspaper in front of your face. It is true that you finish but one slice at a time and may get discouraged because the family devours it as fast as you are able to toast it, and you are unable to sit with them at the breakfast table, but this cannot well be avoided, as you well know that toast made in advance is not real toast. You also know that toast made on top of the stove or in an oven is not real toast either—that toast, simple as it seems, is one of the most difficult things to make properly.

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Next to the electric toaster, the best way is to take the lid off the kitchen stove. Which do you prefer?

Yours very truly.

Now, the fact that this letter takes as its motif an old wood-burning kitchen range, when as a matter of fact the small city in which it was mailed used only coal and gas, did not bear on the results whatever. It did furnish two contrasting pictures and the use of the electric toaster was thereby brought out favorably. I surely believe it is worth while to have each letter addressed to the lady who is to receive it.

I have wandered out of bounds so many times in this discussion that no attempt will be made to cover any suggestions as regards follow-up methods of the salesmen. We must follow up, else no matter how much our advertising may pay, we are wasting much of its potency.

The copy of our advertisements should change frequently. The same wording should not stand for more than two days, and it is better to change it every day, if we can. If we wish to advertise a certain drive six days and only wish to supply two changes, then let them alternate instead of running three days continuously each.

There is as great a difference of opinion about the use of dodgers or hand-bills as there is about every other form of advertising. The truth is that each man develops greater strength in one line than he does in others. Personally, I freely admit my deficiency in launching a dodger which will be satisfactory. They certainly can be used to advantage announcing that demonstration we talked about a while ago, however; but if it is to be a demonstration of an electric toaster take especial pains not to say so. Instead, advertise is as a demonstration of making toast electrically. It may sound about the same, but there is all of the difference in the world. It seems to me a letter is better than a circular.

Co-operation means boys to fight, business to provide the necessities, and money to back them—
BUY A LIBERTY BOND

For some mysterious reason, our wiring campaigns are the best things we do as a whole. We all do much better work in those than we do in the sale of devices. One reason perhaps is that electrical societies have gone into this side of it more scientifically than they have at the other side. The manufacturer supplies expensive booklets, expensive newspaper electros, and all sorts of cards, etc. We order them and then waste them by simply sending them out unsupported or backed up by a consistent campaign. If your plan of campaign doesn't call for a booklet there is no use of sending out a booklet just because you have it; and if you send out the booklet by itself and not as a part of a planned campaign, you have wasted the manufacturer's money and your own time, and probably will eventually become of that all but extinct species of mentally deficients who chirp, "advertising doesn't pay. I've tried it and I know."

SOME CONTRACTOR PROBLEMS

BY J. M. CARLSON

(A straightforward consideration of practical problems as they present themselves to the man who thoughtfully analyzes his business. This presentation of some of the things which have not yet been said on the contractor's side of the co-operation question, forms an important part of the Commercial Committee report for the Pacific Coast Section, N. E. L. A., Del Monte Convention. The author is connected with the Central Electric Company of San Francisco, and prominent in contractor-dealer affairs. —The Editor.)

When I was asked to prepare a paper to be read at the convention, there immediately came to my mind many things that I would like to bring to your attention. I would like to tell you what we have accomplished as an association and what we are doing, but we have had many papers along this line and I know that you are more or less familiar with our association work. Instead, I would like to have you consider some of our problems and if possible help us with them.

On every occasion where men meet we hear discussions regarding the various business problems brought on by the existing conditions in the world at the present time. It behooves us, as men engaged in the electrical business, to give some of our own problems serious thought. It is not my intention to try and discuss all of our problems in a short paper of this kind, but just to bring some things to our attention for thought and discussion, and if possible in the near future arrive at a solution of our difficulties that will be fair and just to all.

I understand that another paper is being prepared by a retailer, so I will not touch on any phase of the retailing business, although the contractor and the retailer are very closely related.

As contractor-dealers, we feel that we have a particular place and part in the electrical industry, as well as the central station, manufacturer and jobber. The public cannot get along without the central station, manufacturer, jobber or contractor-dealer, and I feel that one branch cannot give the proper service without the other.

As contractors we should always strive to put our business on a high plane, and keep it there. We all know that the electrical contracting business has suffered in the past by the methods of unscrupulous and incompetent contractors. I refer particularly to the contractor who has started in business on borrowed capital and credit, and boasted that he would show the old established contractor how to do business. He proceeds to take a contract for about one-half of what it is worth, and when extras come up, charges the owner about twice what he should, in order to make up the contract losses; the result is that the owner calls him and all other contractors robbers. On account of taking the contract on such a low basis he cannot afford to employ a competent superintendent, neglects the job, and the further result is he and all other contractors are called unreliable. We should always conduct our business on such a basis that we can give the public the very best quality and service. All contractors should have enough overhead and profit on their contract work so it won't be necessary to overcharge on time and material and extra work to keep from going bankrupt. We can then expect the confidence of the public and more work on a time and material basis.

The contractors themselves have not been entirely responsible for this condition, which to a large extent has been eliminated. The jobbers and wholesalers have permitted this kind of competition by giving credit without proper investigation. I believe that every man who is going to engage in the contracting business should undergo a rigid examination as to his fitness, whether he has any business experience or knows how to figure, his knowledge of overhead expenses and necessary profits. Any contractor in order to continue in business, pay his bills, and permit the old established contractors to pay their bills, must have this knowledge and not start to experiment for a year or two and demoralize the whole electrical contracting business. I want to quote from a letter written by Edward N. Hurley, chairman of the Federal Trade Commission:

"The Federal Trade Commission has found that the majority of retail merchants do not know accurately the cost of conducting their business, and for this reason they are unable to price their goods intelligently. There must be decided improvement in this direction before competition can be placed upon a sound basis, and before we can expect a decrease in the heavy business death rate among retail merchants."

What applies to the retail business applies to us. It is possible to get this knowledge, but some men are so stubborn and "all-wise," they won't listen to reason or take advice. The failure of an electrical contractor through wrong business methods is not only disastrous to himself, but affects more or less all the contractors as well as the industry as a whole. An investigation of the fitness of a prospective contractor would be a protection to him as well as the established contractor. I have been a member of a contractors' association for many years and I don't see how any man can be a permanently successful contractor unless he takes an active interest in association matters.

Sometimes there have been misunderstandings

This is just one of the overhead expenses which must be paid in order for us to have a business at all
BUY A LIBERTY BOND

between the central stations and contractors over costs of installation made by the contractors for the power companies — especially wiring for electric cooking and heating devices. A lot of these misunderstandings could be obviated if the central stations would not lose sight of the fact that the contractors have an overhead expense that must be met, and also need a profit. As stated before, any contractor who desires to give good service to either central station or public must be given enough margin to allow him to employ competent office help and superintendents.

I will not take the time to discuss the proper allowance for overhead expenses, because we have had so many papers and discussions on this subject in the past, but in a little booklet issued by the Federal Trade Commission they give an example how to arrive at the selling price of an article and they use 25 per cent of the selling price as the overhead charge. Now, of course, they do not say that 25 per cent is the proper amount, but you can readily see what their thoughts are. After investigations and experience, we all have definite ideas that remain with us and we give expression to them in one way or another. I believe if everything is taken into consideration it will be found that the cost of installation by contractors is very reasonable by comparison.

As contractors we are very anxious to have the good will and co-operation of the central stations, as well as of the other branches of the industry, but of course we would like to have our part in the industry recognized. We are always open to suggestions and constructive criticism, as we are anxious to put our selves in position to serve the central station and consumer.

We have enjoyed for some time the co-operation and good will of the jobbers and we appreciate it, but there are still some things that we feel need correction. There is a great deal of so-called industrial business that should be taken care of by the contractor-dealer. I do not mean certain large industrials that buy thousands of dollars worth of electrical goods and employ a force of electricians doing new work and extensions, but there are hundreds of small industrials and office buildings, etc., that I feel we can take care of just as well if not better than the wholesaler. It is not always necessary that we should furnish electricians to these office buildings and small industrial plants in order to supply them with their material, because often they have a man to make their small extensions and renewals. There must be a good deal of this kind of business because many times I have been in the wholesalers' stores and watched a clerk show the handy man how to connect up sockets, attachment plugs, and even lay out small wiring jobs, while wholesale customers were waiting.

I believe if the jobbers would make their stores, and windows especially, look more like wholesale establishments they would not attract retail customers and small industrials. Instead, we see fuses, sockets, attachment plugs and dozens of other small articles laid out in the window, which at once gives the impression that it is a retail store. Other businesses that draw a very distinct line between wholesale and retail make their stores look either like a wholesale establishment or a retail store, and put up the proper signs. Although conditions for contractor-dealers handling industrial business are not as favorable as we would like to have them, some contractor-dealers through the service they are rendering have secured the industrial business in their immediate neighborhoods. As other contractor-dealers develop their service to industrials and demonstrate their ability in this direction, we believe the jobbers and manufacturers will find that we can serve them as well as serve the customers in handling this industrial business and that they will therefore help us to place that class of business on a better basis.

There is another matter I want to bring up for consideration, and that is our relation to the electrical engineer; I mean particularly the engineer that lays out wiring plans and draws up specifications for buildings and industrial plants, etc. Some time ago we felt as contractors that this part of the work belonged to the electrical engineers and the contractors should refrain from laying out work and writing specifications. We of course in turn expected the electrical engineers to recognize the fact that all installation work should be done by the contractors. Instead, we find in a good many instances the electrical engineer recommending to the owners the employing of a foreman, hiring electricians, and the direct purchase of materials, cutting out the contractors entirely.

We do not believe that the owners finally save any money by this method, and their office has the constant worry and detail work which is additional expense. If the installation work is handled by a reliable contracting firm, they shoulder all worries regarding labor and material, finally turning over the completed installation to the owners, without, I believe, any greater cost than when handled by owners direct through a foreman.

In conclusion, I want to say that I have not tried to bring out all the points involved in the different matters I have brought before you, but only endeavored to bring these things to your attention so we can discuss them freely and frankly. As contractors we are anxious to co-operate with central stations, manufacturers, jobbers and electrical engineers, and ask your support and co-operation.

An automobile is a good thing when it is in good running order and every part is in its proper place, and is performing its proper duty; but just as soon as a part gets out of place and tries to do something for which it was not intended, there is trouble and the whole automobile looses its real usefulness. The same applies to our industrial activities.

As I have said, we all have a place in the electrical industry and our slogan should be "All together, every branch in its place, for Everything Electrical."

Our duty is a thing no one else can do for us—BUY A LIBERTY BOND

BETTER SELLING METHODS

(Increased efficiency in business is the greatest of war savings. The work which is being done to this end in the electrical industry, as instanced in the electrical co-operative campaign, and suggestions for the future, form the main body of the Commercial Committee's report for the Pacific Coast Section, N. E. L. A., convention. An important recommendation for the concrete organization of working data is contained in the report of the sub-committee which follows.—The Editor.)

In order to fully outline the first section of this committee's work, we again call your attention to the following two paragraphs quoted from the Commercial Committee's report that was read at the Riverside Convention last year:

"It is the sense of the committee that the member companies of the Pacific Coast Section get solidly behind the dealer and contractor movement, support the California State Association of Contractors and Dealers by helping it to create a fund for handling its work to better advantage, including the employment of a competent field man, and take advantage of the large volume of advertising, both national and local, already in the field, to the end that the central station of this territory may get the benefit to the fullest extent, of all elements that go to make up the industry.

"We believe that the member companies will benefit by fuller co-operation with the organization of contractors and dealers, with the thought in mind that in the contractors and dealers the central stations have active and energetic salesmen without the necessity of having these men on their payrolls. We believe the time will come when the central stations can leave the merchandising subject entirely in the hands of the dealers, with such supervision as must naturally be exercised by the central stations to get the best results for all interests."

The discussion following that report finally resulted in the following resolution being adopted by that convention:

"That the member companies of the Pacific Coast Section lend active co-operation and support to the California Association of Electrical Contractors and Dealers and that a proposed plan be formulated by the Commercial Committee."

Your committee, assisted by the contractor-dealers and the jobbers, carried out the instructions contained in this resolution, and late in September placed before the Executive Committee of the Pacific Coast Section, N. E. L. A., before the California Electrical Supply Jobbers, and before the Executive Committee of the California Association of Electrical Contractors and Dealers, a proposed plan for a co-operative sales, advertising and educational campaign.

The plan, after some modification, particularly in respect to the method of management, was endorsed by executive committees representing the central station, jobber and contractor-dealer organizations, and an advisory committee of eight members was appointed to carry on the work. The advisory committee is charged with the direct conduct of the campaign and is responsible to the central station, jobber and contractor-dealer organizations for its successful progress.

A fund amounting to approximately $12,000 was subscribed to defray the expenses of the campaign. The various interests subscribed to this fund approximately as follows:

Central Station Companies	$6,000
Jobbers	3,000
Contractor-Dealers	2,000

the remaining $1,000 being made up by a few manufacturers.

The plans of the advisory committee for the use of this $12,000 fund are based on the original recommendations of your Commercial Committee, amended by the executive committees of the organizations interested.

The advisory committee has outlined the plan approximately as follows: They feel that the development of a successful co-operation and understanding between the central station employees and the dealer-contractors and their employees is an essential foundation for future development and educational work. It is therefore the committee's object to bring about a better understanding of the duties of the contractor-dealer and of the central stations to each other and to cause the individuals affiliated with every branch of the electrical industry to have a better knowledge of their proper attitude toward companies and individuals in other branches of the industry. Following this foundation work will come the accomplishment of the objects specifically outlined in the Commercial Committee's plans, namely: Stimulate the sale, installation and use of all kinds of current consuming electrical devices; to originate a suitable trade mark for the California Association of Electrical Contractors and Dealers and to promote its use in electrical advertising; to help the contractor-dealers to improve their business methods, including accounting, sales, advertising and general store appearance, and finally to elevate the retail side of our industry to that position in the commercial world to which it is justly entitled.

Many central stations have indicated their willingness to contribute to the committee a portion of their regular newspaper advertising space, which is to be used to advertise the electrical idea and to feature the electrical dealer and the association's trade mark.

The California Association of Electrical Contractors and Dealers has contributed a portion of the services of their secretary, who now acts as secretary of the advisory committee.

Two field men have been appointed to carry on this educational work under the immediate direction of the advisory committee. The field men are expected to visit and work in various towns throughout the state, one in the southern end of our state and the other in the northern end. Wherever it seems advisable a special get-together meeting will be arranged by the advisory committee, through the field man, in towns where it seems that such a meeting will help forward the work of the campaign.

The field man is expected to visit the central station managers and employees in the towns visited in

You don't expect to gain victory without paying something for it — BUY A LIBERTY BOND

an endeavor to influence them to closer co-operation with the contractor-dealers and their association. He is to promote better acquaintance between the central station employees and the dealer-contractors, and to encourage the central station manager to indicate to his organization that it is the central station's policy to support this co-operative campaign. The greater portion of the field man's time, however, will be spent with the dealers and contractors, assisting them in their efforts to improve their business methods, including accounting, sales advertising and general store appearance, and also to secure their closer co-operation with the central station in their town.

The advisory committee handling this campaign includes men from all branches of the industry, and from all sections of the state. It consists of:

L. H. Newbert, chairman, manager Commercial Department Pacific Gas & Electric Company, San Francisco, Cal.
G. E. Arbogast, vice-chairman, Southern California Edison Company, Los Angeles, Cal.
G. B. McLean, assistant superintendent of sales, Southern California Edison Company, Los Angeles, Cal.
A. E. Wishon, assistant general manager San Joaquin Light & Power Corporation, Fresno, Cal.
R. M. Alvord, chairman Commercial Committee, N. E. L. A., local manager supply department General Electric Company, San Francisco, Cal.
D. E. Harris, sales manager Pacific States Electric Company, San Francisco, Cal.
H. C. Reid, president California Association of Electrical Contractors and Dealers, Pacific Fire Extinguisher Company, San Francisco, Cal.
M. L. Scobey, Home Electrical, San Francisco, Cal.

The reports of progress that have appeared in practically every issue of our local electrical press since last December are but one evidence of that committee's activity in carrying forward the work allotted to it. The Commercial Committee sees in this campaign the vehicle by which our industry may reach the satisfactory co-operative basis suggested in the report of last year's committee, particularly in the paragraphs previously quoted, and therefore again recommends that the member companies of the Pacific Coast Section get solidly behind this campaign work, not only with the funds which they have contributed, but with enthusiastic moral support.

The second section of the committee's work consisted in preparing or having prepared the four papers for this convention, and a report on industrial electrical heating. It was the consensus of opinion of the members of your committee that, although there would be no time to present the industrial electrical heating report at this convention, a subject of such rapidly growing importance as a central station load builder should not be entirely overlooked, and that this year's committee should carry on the excellent work that was started by Mr. Holloway in connection with last year's Commercial Committee. Consequently, a report on Industrial Electrical Heating was prepared by the sub-committee composed of E. A. Holloway, J. B. Black and E. B. Walthall. This report is published in the current issue of the Journal of Electricity. Your particular attention is called to the recommendation made in this report to the effect that future Commercial Committees adopt a similar plan of appointing a sub-committee on Industrial Electrical Heating to carry on further investigation and collection of data on this important subject.

The paper entitled "Bricks Without Straw," prepared by the sub-committee consisting of G. B. McLean (Chairman), W. S. Berry, C. M. Einhart, H. J. Kister and Miles Steel, contains a recommendation that should have your consideration at this convention. It is to the effect that the advisory committee handling the California Electrical Co-operative Campaign be authorized and be supplied with the necessary means to collect and catalogue all valuable sales data on electrical subjects, not only for the use of central stations, but for jobbers, dealers and contractors as well. It is the committee's desire that plans be adopted for carrying out the idea of this recommendation.

The committee further points out that this recommendation is in no way contradictory to that of the Industrial Heating Committee's report, as the advisory committee of the California Electrical Co-operative Campaign would need the assistance of the Commercial Committee, and of other bodies, in carrying out the recommendations made in the paper "Bricks Without Straw."

The Commercial Committee solicited a paper from an electrical jobber and one from an electrical contractor.

The paper presented by Mr. T. E. Bibbins contains an outline of the factors that make for success in the Electrical Jobbers Association, factors that can well be adopted by all in securing the closest working arrangement between all members of the industry—be they jobber, contractor, manufacturer or central station.

The paper "Some Contractor Problems," presented by Mr. J. M. Carlson, points out some of the problems of their particular branch of the industry, and indicates that they are alive to some of the difficulties that they themselves must overcome within their own ranks in fulfilling their obligations as a major division of the electrical industry.

It was the opinion of the committee that it would be fitting that there should be presented at this convention not only reports of particular value to central station men, such as the industrial heating report, but also a paper or report that would give in a similar detailed way practical information that would be of value to the electrical retailer. It was felt that the small central station operating retail stores, as well as the retail electrical dealer, could profit more than they now do by the adoption of retail selling practices that have been found of value in other industries. The paper entitled "Retail Selling Practice," prepared by the sub-committee consisting of L. H. Newbert (chairman), H. F. Aller, E. B. Criddle, H. A. Lemmon and M. L. Scobey, therefore, goes much into detail respecting the retail selling practices that are there outlined. Mr. Newbert has announced that credit is also due to Messrs. G. O. Mantle and H. R. Wilbur of his office, who have been material contributors, and of particular assistance in the preparation of this paper.

It has been suggested informally by members of the advisory committee of the Co-operative Campaign

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that their committee would probably desire to distribute generally to dealers and to central stations operating stores, reprints of this paper, particularly as it may well be considered a text on the subject of retail selling.

In all of our work the members of your committee have kept prominently in mind the fact that we are at war, and that all we are doing, and will do, must be measured by the question "Will it help win the war?" We feel that any study that will assist toward more efficient operation, which will enable us to do with less men the work which we did two years ago, will help in that our most important work. We have therefore presented in the reports and papers ideas which we felt would aid men in all branches of our industry to higher efficiency in their various endeavors.

We add the very definite recommendation that our selling force should be directed to the exploitation of those electrical devices that may be used in the home, on the farm and in the factory to increase efficiency in those places, and particularly to those cases where electricity generated by water power may be used in mechanical or heating processes for which energy is now supplied from our diminishing supply of fuel. The electrically heated core baking oven will increase the efficiency—particularly from the labor and fuel standpoint—in the foundry; the electrically operated feed grinder or water supply system will release labor and increase farm efficiency, while the electrically operated washing machine will in a like way assist in the home.

There is enough work in this program to provide profitable activity for all of us. We are going to win this war. Let us sell the "Electrical Way" in all places where it will increase efficiency and conserve labor and fuel for the more important purpose of bringing nearer the final success—Enduring Democratic Peace.

"BRICKS WITHOUT STRAW"

BY G. B. McLEAN (CHAIRMAN), W. S. BERRY, E. M. EINHART
H. J. KISTER, MILES STEEL

"Ye shall no more give the people straws to make bricks, as heretofore. Let them go and gather straw for themselves."—Exodus 5:7.

The outlook was very dark in the latter weeks of the old year to the heads of central station commercial departments. When the order went forth that money was not available for extensions and that it would not be possible, therefore, to continue to take on business at the same rate as heretofore, gloom settled in the new business offices in thick, clammy chunks.

At the time of the appointment of your committee in the first week in January, to prepare a paper on "Bricks Without Straw," the depression in the sales departments had communicated itself to all branches of the industry and the year 1918 was looked forward to with misgivings and counterfeit enthusiasm. Consequently your committee went to work with heavy hearts and little hope of any great success on a paper on such a subject under the apparently unfavorable circumstances.

In this country and Canada, the best thought of the industry has been applied to load factor building and saturation problems. The selling of juice has been brought up to the dignity of an art and has been treated from a multitude of angles by the commercial section of the N. E. L. A. and the Society for Electrical Development. An exhaustive paper would really consist of a summarization of the publications of these two bodies, treated with special attention to load building, necessitating a minimum increase in capital invested. In the case of the commercial section, this has partially been done in the Salesman's Hand Book. If the vast amount of data and the original ideas and suggestions published by the Society for Electrical Development could be catalogued, cross-indexed, and added to the Salesman's Hand Book, the result, we believe, would be probably the sum of human knowledge on the subject. Your committee ambitiously attempted to do this work and, in addition, to cull the recent files of the current electrical magazines, epitomize the data and present it in the form of condensed suggestions for high return business getting. The task was found to be entirely beyond either the capacity of the committee, or the time at its disposal, and the idea was reluctantly abandoned.

During the time spent in an endeavor to make a condensed resume of the mass of data referred to, events were occurring in our world which were to entirely change the whole complexion of things. It is not necessary to go into the history of the causes here; suffice to say that the result showed nothing less than the fact that electricity had won its great fight, at least here on the coast. The years of painful pioneer work appeared to suddenly bear the fruit of positive success; central station service came into its own; we went over the top and the enemies' trenches were captured. Now we have only to consolidate our ground, perfect our communication system and the future is secure. There will be skirmishes here and there and possibly a hot little scrap occasionally, but we have the business coming to us now instead of having to go to the business—agricultural load, industrial, isolated and refrigerating plants, cooking and heating load, irrigation, rock crushing and mining. Central station offices in California are besieged by day and agents are called out of bed at night by anxious applicants for central station service. The question now with the man who must see, sew, churn, milk, pump, dig, heat, freeze, drive, lift, grind, or do practically anything in the realm of human industry, is not "Shall I perhaps consider electricity" but "Can I possbily get electricity?"

Electricity in universal demand and the nation in the greatest struggle of its life, we are not confronted with the problem of increasing our load or increasing our saturation, but we must wisely endeavor to segregate the load proffered and arrange to serve that which is the more important in its relation to the war. Our question should be in considering the taking of load, does it mean more food, more supplies, more equipment, or is it simply for the convenience or profit of the applicant? With the great impetus given agricul-

What do you mean, you are an American?—BUY A LIBERTY BOND

ture and manufacturing, for the world's need, we feel that every central station in our section will have its resources taxed to the limit if it provides the energy necessary for such increased burden.

To be sure this is an abnormal situation. A cessation of hostilities would materially change conditions. Nevertheless, we do not believe it will ever again be necessary to bear the burden of such a competition as has characterized the last fifteen years. But it will be very necessary to organize the industry as a whole to keep pace with the marvelous development which some of us think we see in the very immediate future. This organization can best be accomplished by the intelligent prosecution of the co-operative campaign fairly launched. The insistent demand for electrical energy is an established fact. To meet this demand with the best interests of all concerned, let the central stations turn their attention to producing the current and developing the still available water power resources of our great Southwest; let the manufacturers make an honest effort at quantity production at fair prices, furnishing the necessary equipment for all branches of the industry with an eye to future development, rather than present profit; let the jobbers strive to finance complete stocks and liberal, intelligent credit policies; let the contractors get together, co-operate and endeavor to handle their affairs on a standardized business basis; let the dealer make his store attractive and his methods of merchandising and accounting be done in conformity to a general organized plan. This sounds like a large order, but your committee feels that the time is ripe for the filling of just such an order and that the advisory committee of the co-operative campaign is the instrument ready at hand.

It is therefore the recommendation of this paper that the advisory committee be instructed to codify, catalog and index the data contained in the Salesman's Hand Book, the recent publications of the Society for Electrical Development, and the recent files of the leading electrical magazines, together with such other available data and information as may be pertinent, with the object in mind of assisting the jobbers, contractors and dealers to do their part in the co-operative scheme sketched above; that the data so obtained be kept in an easily extendable form on cards; that each use for electricity be a subject head, and that all suggestions from whatever source be added from time to time to these cards; that the field men be instructed to carry this data when making their rounds and make liberal use of it in suggesting new and improved methods. For example, the heading "Residence Lighting" would, in addition to the wall sockets, base plugs, indirect lighting, portable lamps, etc., call special attention to the 50 watt lamp and would contain suggestions for popularizing it at the expense of the 40 watt. It would also point out to dealers the advantage of a more extensive use of telephones as a merchandising agent. One central station tried the experiment of selecting fifty consumers' names at random. Twenty-five were called over the telephone and a sales talk was given on lamps, and twenty-five were called upon by a salesman. The telephone calls resulted in renewing thirteen 60 watt carbon lamps and in selling six 60 watt and one 75 watt tungsten lamp, while the personal calls resulted in renewing eight 60 watt lamps. The sales advantage of the telephone over the personal call is quite apparent in this instance.

"Residence Power" would contain data covering the merchandising of fans, washers, cleaners, small motors, grinders, polishers, with suggestions to the contractor showing him how to get the co-operation of the architect in providing for this class of load in new houses, and to the dealer for the handling of the more expensive apparatus on the installment payment plan. Cooking in the home should be treated as a special subject and all possible data, of which there is now a very considerable amount of a reliable sort, given to the dealer for the purpose ultimately of relieving the central station of the burden of merchandising domestic cooking outfits. Another instance, in ornamental lighting, a central station recently obtained a contract for post lighting which was financed in a new and painless manner. The contractor should work up such business and make the profit. Teach him how.

Water heating, air heating, agricultural power, industrial power and heating, and specializing load of every description, should each and all be treated with the co-operative end in view, giving to each class that data which will best aid in the particular part to be performed by that particular class.

The Romans had a saying, "Non Sine Labore," "Nothing Without Labor." The success already achieved has been at the expense of heart-breaking toil. The objectives aimed at in this paper will only be attained by most strenuous endeavor on the part of all and more particularly by the intelligent effort put forth by the contractors and dealers in organizing themselves to take their responsibilities. Not a job to be done in days—years may be necessary to complete our picture—but we believe it will be completed.

We are at the threshold of the greatest expansion this industry of ours has ever seen. It may appear to some that your committee has been carried away by an enthusiasm which is not warranted by the facts. Time must prove whether we are right or wrong, but if we may venture to prophesy, we believe that the next few years will see a development in the practical applied use of electricity, which particularized now, would sound too optimistic, and that in this development, the jobbers, contractors, and most of all the dealers, will be found to occupy that place which is by right theirs, and to lend that aid to the general result which they should lend as necessary and component parts of the great industry which is the bread and butter of us all. The future is certainly bright and to your committee the road seems open to the promised land where Bricks without Straw will be among the memories of battles won and obstacles surmounted.

A republic depends on its citizens doing their duty because they recognize it—
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SPARKS—Current Facts, Figures and Fancy

(Geography is being much changed these days in Europe—and in America, too—according to recent reports of the Geologic Survey. The application of electricity to war conditions from "All Clear!" signs for aerial raids to the stabilizing of aeroplanes, the saving of coal in Switzerland and the teaching of war saving in domestic science schools conducted as part of a range campaign in this country, is significant of the day. The money thus saved, presumably, is to be put in Liberty Bonds.—The Editor.)

During the recent cold weather of the East there were many localities in which the only utility which didn't peter out was electric service. Further comment would be superfluous.

* * *

Fifty-ton electric locomotives are being used for freight handling by a Manchurian coal mine. They are of the two-bogie type, each bogie carrying 125 horsepower motors, and they are the first of the kind ever built at the South Manchuria railway workshops.

* * *

Orville Wright is credited with having invented a new type of airplane stabilizer. This stabilizer, operated electrically, rejects the old principle of the gyroscope and substitutes a pendulum which swings in water. This motion controls the supply of current to a small propeller over the pilot's head.

* * *

Although illuminated signs have been forbidden in London, owing to air raid danger, they are being used in one suburb of London to warn citizens against these very raids. "Take Cover!" flashed at every lamp post, warns citizens of an impending attack, and "All Clear!" signifies that danger is past and traffic may be resumed.

* * *

Luminous paint has found many applications in the home, from assisting the householder to find the matchbox to giving the position of the electric switch. It is reported that it is being put to many uses in the present war. Luminous gun sights are no secret, but there are said to be many other applications which cannot be described at present.

* * *

You may not be on the map, according to recent Geologic Survey reports — at least not at the place where you ought to be. You may be five or six miles distant from where you are. A re-survey and determination of latitude and longitude, which has fixed definitely many thousands of points over the United States, has shown that former maps were often inaccurate to a quite appreciable extent.

* * *

While it was well known that the large colony of squirrels in a Georgia community were active in their attacks upon the pecans grown there, it was a surprise to learn that they had gone so far as to attack the telephone wires, but such has been found to be the case. When complaints were sent in of trouble in one of the residential sections of the city and the telephone company went to locate it the lead in one of the large cables was found to have been gnawed three-eights of an inch deep by the sharp teeth of the squirrels.

* * *

The gain in profits to the farmers alone in a year, through the rise in the value of farm products over normal pre-war levels, is estimated at over six and one-half billion dollars, or sufficient to more than twice cover the total offering of the Liberty Loan now being subscribed by the American people.

* * *

It is reported that the French are making extensive use of electricity at the front in the operation of all kinds of excavating machines. Working in ordinary earth, four men with two wheelbarrows and a machine driven by an electric motor, can shift from 25 to 35 tons a day. In a month a shelter with sleeping accommodation for 500 men can be dug by a single company.

* * *

In order to save coal which can only be imported from Germany, Switzerland is reported to be planning to electrify its entire railroad system. This will necessitate the further development of Swiss water powers and the construction of new power works for about 500,000 horsepower turbine development. The necessary power stations will have to furnish about one and a half billion kilowatt hours a year.

* * *

A domestic science school held in connection with a gas and electric company's demonstration of ranges was found to be an excellent medium for teaching lessons of war saving. A most comprehensive course in mixed breads was carried out by one such group. In connection with this "food conservation" institution, which has an enrollment of from 300 to 500, is a course for boys in gardening, given by a government demonstrator.

* * *

The prediction that London fogs will be entirely done away with by electricity is not based on experimentation with some new type of machine, but a result which is claimed as a future consequence of the plan to electrify all factories, railroads and households of Great Britain. This would effectually do away with smoke, and as the notorious London fog is caused by certain atmospheric conditions through which smoke is held down, London's fogs are expected to be a thing of the past.

Can you measure up your record with theirs?—BUY A LIBERTY BOND

PERSONALS

David M. Folsom, professor of mining engineering at Stanford University, who has been appointed Pacific Coast Fuel Oil Administrator by Mark L. Requa, is formulating valuable data that should prove helpful in assisting in fuel oil conservation. Some months ago Mr. Folsom, together with Max Thelen, president of the California Railroad Commission, and Eliot Blackwelder, professor of geology at the University of Illinois, serving as a Petroleum Committee for the California State Council of Defense, issued a book of two hundred pages on the subject of petroleum which has proved exceedingly valuable. At the San Francisco engineers' banquet to Professor George F. Swain, held at the Palace Hotel, March 20, 1918, attended by some three hundred prominent engineers, Mr. Folsom established a high degree of confidence among his hearers in his outline of the work that he hopes to accomplish in fuel administration.

R. E. Davis of the Portland office of the Pacific Power & Light Company, is absent on a two or three weeks' trip to New York.

Murray Parsons has been appointed roadmaster of the Visalia Electric Railroad, of Exeter, Cal., succeeding Samuel W. Card.

J. J. Mahoney has been elected first vice-president of the Fresno Interurban Railway, of Fresno, Cal., succeeding Paul C. Fratessa.

Joe E. King, local superintendent for the Southern Sierras Power Company, Corona, Cal., has been transferred to a similar position at San Bernardino.

C. G. A. Baker of San Francisco, vice-president of Baker-Joslyn Company, has returned to San Francisco after a visit to the Seattle branch of his company.

Norman Macbeth has been appointed secretary, treasurer and general manager of the Glendale & Montrose Railway, of Glendale, Cal., succeeding W. J. Bohon.

F. G. Beck, assistant general manager of the National Carbon Co., Inc., Pacific Coast Division, left this week for an extended business trip through Washington, Utah and Montana.

M. E. De France, formerly electrical superintendent of the Hot Springs Street Railway, of Hot Springs, Ark., is now connected with the Deming Ice & Electric Company, of Deming, N. M.

Mark Eldredge, formerly electrical engineer for the Tata Hydro-electric Company of Bombay, India, is a recent San Francisco visitor and is a guest of the San Francisco Engineers' Club.

W. L. McKinley, of the Sierra & San Francisco Power Company, has been elected president of the Monterey & Pacific Grove Railway Company, of Monterey, Cal., to succeed Charles N. Black.

G. E. Swett, formerly sales agent for the General Electric Company, Seattle, has resigned from that company and entered the employ of the Pacific Machine Shop & Manufacturing Company of Seattle. This company makes a complete line of electrical auxiliary equipment for ships.

J. R. Fairchild, master mechanic of the Western Ohio Railway Company of Wapakoneta, Ohio, has resigned to accept a similar position with the Seattle & Rainier Valley Traction Company, of Seattle, Wash.

W. R. Lyon, secretary and auditor of the Los Angeles & San Diego Beach Railway, of San Diego, Cal., has also been appointed vice-president, purchasing agent and chief engineer of the company, succeeding W. J. Gough.

M. H. Aylesworth has been appointed assistant to S. R. Inch, the newly elected vice-president of the Utah Light & Power Company, of Salt Lake City, Utah. Mr. Aylesworth is a member of the Public Utilities Commission of Colorado.

Thomas F. Murphine has been appointed to the position of superintendent of public utilities of Seattle, succeeding A. L. Valentine, who has occupied the position for the past nine years. Mr. Murphine is an attorney and has been prominent in the political life of the city for some time.

George F. Swain, professor of civil engineering at Harvard University, and the recent deliverer of the Hitchcock lectures in the Greek Theatre at Berkeley, was granted the degree of Doctor of Laws at the Charter Day exercises in connection with the recent semi-centennial celebration of the University of California.

Frederick W. Johnson, advertising manager for the Puget Sound Traction, Light & Power Company, formerly at Bellingham, Wash., has been appointed assistant to E. C. Macy, in charge of all construction for the Stone & Webster Corporation in the Northwest, with general headquarters in Seattle. Mr. Johnson has been in the employ of the Puget Sound Company since July, 1906, in various capacities.

George A. Hughes, president of the Edison Electric Appliance Co., Inc., with headquarters at Chicago, will be present at the Del Monte convention of the Pacific Coast Section, N. E. L. A. Mrs. Hughes will accompany him, and she has consented to give a paper at the women's session of the convention, on war service of electricity in the home. Those who attended the Spokane convention of the Northwest Electric Light & Power Association will recall the many accomplishments of Mrs. Hughes and anticipate much helpfulness from her presence at the convention session.

E. M. Cutting, western manager of the Edison Storage Battery Company, with headquarters in San Francisco, leaves on April 16, 1918, for the Hawaiian Islands to be gone for a month or six weeks, to take a much needed rest, Mr. Cutting has long been an active factor in affairs electrical on the Pacific Coast, and has served a term as president of the San Francisco Electrical Development League. The best wishes of the West go with him, and the hope is expressed that he will return soon after a safe and health-giving voyage to the Tropics.

Willis H. Booth, chairman of the board, Edison Electric Appliance Company, and one of the founders of the "Hotpoint" appliances, has again demonstrated his public spirited attitude. At the recent launching of the California Co-operative Electrical Campaign, Mr. Booth showed in his powerful address that confidence is the most essential factor in making for success in the new undertaking. Those in attendance — manufacturer, jobber, contractor-dealer, central station man—went away, as a consequence, with a more earnest resolve to put into practice to a higher degree than ever before the principles of mutual co-operative helpfulness.

If we don't fight the war out now we shall have to fight it over again — BUY A LIBERTY BOND

Allen H. Babcock, consulting electrical engineer for the Southern Pacific Company, has been appointed by Secretary Daniels as Western representative for the Naval Consulting Board. Mr. Babcock's office will be at 65 Market street, San Francisco. The Naval Consulting Board has for its distinguished head Thomas A. Edison, and includes many noted Americans. Since its organization it has been busy testing and passing on thousands of inventions and devices of an offensive and defensive nature, for the use of both the Army and Navy. Many of the inventions offered have been adopted, and have proven very useful. The functions of the Naval Consulting Board are best expressed in saying that it offers means whereby the government may be able to avail itself of the technical ability and native ingenuity of all of our people, by affording a direct line of communication between those who believe they have a device or suggestion of use to the government in the present emergency and the proper government officials. At the present time suggestions on the following subjects are particularly desired: Gases, both inflammable and poisonous; aeronautical devices or improvements; internal combustion motors; mines or torpedoes; submarines; ordnance and explosives; radio communication; ship construction and propulsion; life-saving appliances; aids to navigation; food and sanitation. As Western representative of this organization, Mr. Babcock will give immediate personal attention to local inventions, and is prepared to transmit all such direct to Washington. Mr. Babcock has long been identified with the engineering profession in the West, and has just recently been named by the nominating committee of the American Institute of Electrical Engineers as a vice-president for the ensuing year. His patriotic task deserves the backing of all citizens, and it is confidently expected that Mr. Babcock will have every support possible from all quarters throughout the West.

Wallace S. Clark, manager of wire and cable sales of the supply department of the General Electric Company, is a recent San Francisco visitor.

A. G. Wishon, general manager of the San Joaquin Light & Power Company, has left for a sixty day trip in which he will visit many points of interest in the East.

Elmer Jonsson, once a member of the Provo division of the Utah Light & Power Company, is now Captain Jonsson with the American Expeditionary Forces in France.

Lieut. Wm. Hoff of the Puget Sound Traction, Light & Power Company, reports that he is stationed in New Orleans as first lieutenant in the Artillery.

C. M. Brewer, manager of the Richmond, Cal., division of the Western States Gas & Electric Company, has been re-elected director of the Richmond Chamber of Commerce.

Elmer Dover, vice-president of H. M. Byllesby & Company, with headquarters at Tacoma, Wash., has been appointed general chairman of the Third Liberty Loan Campaign for the district of Tacoma.

W. D. Ward, sales engineer of the Pelton Water Wheel Company, with headquarters in San Francisco, is doing some effective work for the Council of National Defense in compiling data on water powers of the West.

H. Westbury, salesmanager Westinghouse McCandless Miniature Company, is visiting the Pacific Coast, and is now at Los Angeles with W. C. Wurfel, Pacific Coast manager of the Westinghouse Lamp Company.

M. J. Walsh of the M. J. Walsh Electric Company, Portland, is leaving for the East to secure up-to-date ideas to use in the new home of his company, which will, on and after June 1st, be at Fourth street, between Washington and Stark streets.

John B. Miller, formerly president of the Southern California Edison Company, has been made chairman of the board of directors for the company, while **W. A. Brackenridge** has been elected president, **R. H. Ballard** first vice-president, and **G. C. Ward,** second vice-president.

J. F. NePage of NePage & McKenny Co. of Seattle, is a recent San Francisco visitor, where his firm maintains a branch office. **V. S. McKenny,** the other member of this enterprising firm, is president of the Washington Association of Electrical Contractors and Dealers.

T. E. Bibbins, president of the Pacific States Electric Company; **H. E. Sanderson,** Pacific Coast manager of the Bryant Electric Company; **Roscoe Oaks,** Pacific Coast manager of the National Carbon Co., Inc., have recently returned to San Francisco after an interesting and profitable visit to their business activities in the Northwest states.

A. D. Page, salesmanager of the Edison Lamp Works of Harrison, N. J., and **J. C. Osborn,** assistant salesmanager, are recent Pacific Coast visitors. In company with F. D. Fagan, Pacific Coast salesmanager of the company, they have made an intensive study of the Northwest, and after a brief sojourn in San Francisco, have returned East via Los Angeles and other points of interest in the Southwest.

Otto W. Peterson, formerly in charge of construction on the Lake Spaulding Development of the Pacific Gas & Electric Company, is leaving for the Orient, where he will install extensive hydro-electric work at Unsan, Korea. Mr. Peterson will be employed by The Oriental Consolidated Mining Company, of which Alf Welhaven, brother-in-law of P. M. Downing, chief engineer of electric generation of the Pacific Gas & Electric Company, is general manager.

John A. Britton, vice-president and general manager, together with the entire former directorate of the Pacific Gas & Electric Company, with but a single exception, have been unanimously re-elected at a largely attended meeting of the stockholders held in San Francisco, April 9, 1918. The complete directorate is as follows: F. B. Anderson, Henry E. Bothin, John A. Britton, W. H. Crocker, F. G. Drum, John S. Drum, F. T. Elsey, D. H. Foote, A. F. Hockenbeamer, Herman B. Livermore, John D. McKee, John A. McCandless, C. O. G. Miller, W. G. Henshaw, and George K. Weeks.

J. W. Lowrie has been appointed traffic manager of the Bamberger Electric Railroad, of Salt Lake City, Utah. Mr. Lowrie has had 21 years of railway experience in various departments. He received the foundation of his railroad training in Scotland and came to this country in 1901. Going West, he went to work in the division superintendent's office of the Northern Pacific Railroad at Livingston, Mont., and after several years of service in various departments, moved to Chicago and became connected with the traffic department of the Illinois Central Railroad, where he has been employed for the past twelve years.

E. W. Pierce, of the Beaver Electrical Company, as representative from the contracting interests; **W. H. Pickering,** maintenance electrician for the county of Multnomah, as representative of the electrical workers; and **F. D. Weber,** Portland representative of the Journal of Electricity, and chief electrical engineer of the Oregon Insurance Rating Bureau, representing the public at large, have, under the provisions of the lately adopted electrical ordinance of the city of Portland, Oregon, been appointed by the mayor of the city as a board of examiners. One of the sections of the new ordinance provides for the examination of all electrical men desiring to be rated as supervising electricians.

Do you mean it when you say the war is your first interest? — BUY A LIBERTY BOND

MEETING NOTICES FOR ELECTRICAL MEN

(Plans for spring conventions form the most interesting developments of the last two weeks. The details of the coming Del Monte Pacific Coast Section, N. E. L. A., Convention are given elsewhere. The national organization is already planning a meeting in Atlantic City for June. Hot Springs, Va., is to be the meeting place of the National Electric Supply Jobbers Association. Interesting reports of local meetings are further included.—The Editor.)

Portland Sections, N. E. L. A. and A. I. E. E.

The regular monthly meeting was held Tuesday evening, April 2d, at the Multnomah Hotel, Portland, Oregon.

Mr. John B. Fisken, superintendent of light and power of the Washington Water Power Company, Spokane, Wash., presented a paper on "Changes in Distribution System on Account of Range Load." Mr. Fisken's paper gave in detail the proposed distribution system for the city of Spokane, Wash., in order to ultimately handle 5000 ranges. He also submitted approximate costs and earnings from such a system. It was a comprehensive method of attacking the problem from an engineering standpoint instead of the present haphazard method of connecting on range loads to the distributing system just in order to get service without regard to cost, efficiency or future complications. Great emphasis was laid upon making the system thoroughly reliable and free from interruptions of service, and close regulation.

Mr. W. H. Lines of the Portland Light & Power Company acted as chairman.

The paper was discussed by Messrs. McMicken, Merwin, Schoolfield, Quinan (of Seattle), Searing and Heaston.

It was brought out that the power companies' investment, exclusive of any investment on the customer's premises, amounted to $100 to $120 under present methods of handling distribution systems. The earning power of ranges averaged $36.00 per year per customer; of water heaters, $28.92. The best hope for the future of electric ranges was shown to be the fact that they stayed sold when once sold.

There was a division of opinion on the question of the regulation necessary for successful range operation. Some contended that the same regulation must be maintained for both light and ranges, while others contended that ranges did not require this close regulation. Mr. Fisken used 5 per cent regulation for lights and 3 per cent for ranges. The price of gas in Spokane is $1.40 per thousand. The Portland Railway Company is now using auto transformers on 220 volt lines to connect up ranges and have decreased the cost.

One of the facts which must not be overlooked is that gas prices may be reduced and the gas ranges made more efficient.

The meeting was well attended and thoroughly enjoyed by all present, as seldom is there a paper presented which calls forth such general interest and appreciation. A buffet lunch was served after the meeting.

BUILDERS OF THE WEST—XXVII

H. F. JACKSON

Never before in the history of the electrical industry in the West has a year been more productive of effective results for betterment in efficiency and conservation than the current year in utility life soon to close with the sessions of the convention of the Pacific Coast Section, N. E. L. A. Not only has this industry risen to meet every emergency thrust upon it by the national crisis, but there has been inaugurated a campaign of co-operative helpfulness in utility life that is giving to the nation new ideals in service. To Captain H. F. Jackson, president and general manager of the Sierra and San Francisco Power Company, and president of the Pacific Coast Section, N. E. L. A., this issue of the Journal of Electricity is affectionately dedicated in appreciation of his splendid service to the West in forwarding these new ideals.

The New Year Book of the A. I. E. E.

In the 1918 edition of the Year Book of the American Institute of Electrical Engineers, the names of members who are in the Army or Navy of the United States or allied nations, of which the secretary had been notified, have been designated by a special entry. The total number of members in the uniformed service, including those of which notice was received by the secretary after the Year Book went to press and up to April 1st, is 760, which is over 8 per cent.

National Electric Light Association Convention

The annual meeting of the N. E. L. A., devoted entirely to war problems, will be held at Atlantic City, June 13th and 14th, with the Hotel Traymore as headquarters. While it is felt that it is necessary under the constitution to hold the annual meeting, the essential requirement is the limitation of work in the meeting to the consideration of pressing and vital war problems as related to the industry. In view of the fact, however, that practically all our member companies are short handed and that their officers have their time taken up not only with general problems of the industry, but with local problems and difficulties that come upon them as patriotic citizens, it is believed that the attendance at the meeting will inevitably be much smaller and more restricted than would occur in normal times and under the usual conditions; all other subjects, however important, being swallowed up for the time being in the fundamentally vital and essential one of winning the war.

The committee in charge of the convention comprises the following names from the West: R. H. Ballard, Los Angeles; A. W. Leonard, Seattle; S. J. Lisberger, San Francisco.

The National Electrical Supply Jobbers' Association

The tenth annual meeting of the Electrical Supply Jobbers Association will be held at the Homestead Hotel, Hot Springs, Va., May 21, 22, and 23, 1918.

The Alameda County Electrical Club

The Alameda County Electrical Club held its regular monthly meeting at the Commercial Club, March 21, 1918.

Lieutenant R. B. MacPherson of the Radio School of Military Aeronautics of the University of California gave a most interesting and instructive talk and was enthusiastically applauded.

It was decided to hold the annual smoker in the near future, and President George Drew appointed a committee to make the necessary arrangements for the same.

You know what you think of delinquent members—BUY A LIBERTY BOND

WHERE THE MEN OF THE INDUSTRY MEET

(The place where you can find where and when the other man meets. Information as to changes in officers, or additions or corrections, should be addressed to the Service Editor, Journal of Electricity. It is hoped to keep this directory up to date, so that travelers in a strange town who wish to attend the meetings of allied groups may not be misdirected.—The Editor.)

A. I. E. E.—WESTERN SECTIONS

National Officers
President—E. W. Rice, Jr., Engineering Society Bldg., New York City.
Secretary—F. L. Hutchinson, Engineering Society Bldg., New York City.
Meetings—Monthly.

Los Angeles Section
Chairman — Don. D. Morgan, 621 Pacific Electric Bldg.
Secretary—A. W. Nye, University of Southern California, Los Angeles, Cal.
Meetings—Second Tuesday of each month.

Portland Section
Chairman—S. D. Searing, care Portland Railway, Light & Power Co., Electric Bldg., Portland, Ore.
Secretary—R. M. Boykin, care North Coast Power Co., 441 Pittock Block, Portland, Ore.
Meetings—Monthly.
May 7th—E. R. Shepard—"The Bureau of Standards and Electrolysis Mitigation."

Denver Section
Chairman — Norman Read, 828 Symes Bldg., Denver, Colo.
Secretary — Robt. B. Bonney, 603 Wyoming Bldg., Denver, Colo.
Meetings—Third Saturday of each month, from October to May, at the Denver Athletic Club. Dinner at 6:15 p. m., followed by regular meeting.

San Francisco Section—
Chairman—Lars R. Jorgensen, Chronicle Bldg., San Francisco.
Secretary—Allen G. Jones, Rialto Bldg., San Francisco.
Meetings — Fourth Friday each month—Engineers' Club, 7 p. m.

Seattle Section
Chairman — John Harisberger, 4015—4th Ave., N. E., Seattle, Wash.
Secretary — Glen Dunbar, City Lighting Department, Seattle, Wash.
Meetings—Monthly on third Tuesday in Chamber of Commerce Assembly Room, 9th floor, Arctic Bldg.

Spokane Section
Chairman—Charles A. Lund, W. 828 Providence, Spokane, Wash.
Secretary—J. E. E. Royer, W. 408 Cleveland, Spokane, Wash.
Meetings—Third Friday of each month.
April 19th—"Generation of Power."

Utah Section
Chairman—A. S. Peters, Mountain States Telephone & Telegraph Co., Salt Lake City, Utah.
Secretary—H. T. Plumb, 183 U St., Salt Lake City, Utah.

Vancouver Section
Chairman—R. F. Hayward, Western Canada Power Co., Ltd., Vancouver, B. C.
Secretary—T. H. Crosby, Canadian Westinghouse Co., Vancouver, B. C.

A. I. E. E.—WESTERN BRANCHES

University of California Branch
Chairman — A. J. Swank, University of California, Berkeley, Cal.
Secretary—G. F. Teale, University of California, Berkeley, Cal.

University of Colorado Branch
President—Robt. Newman, 1071—11th St., Boulder, Colo.
Secretary—William N. Gittings, 2429—12th St., Boulder, Colo.
Meetings—First and third Thursdays of each month of the school year in the Engineering Building, University Campus.

Idaho University Branch
Chairman—V. Pearson, Moscow, Idaho.
Secretary — L. J. Corbett, University of Idaho, Moscow, Idaho.
Meetings—First Wednesday evening of each month from October to June.

Oregon Agricultural College Branch
Chairman—J. A. Hooper, Oregon Agr. College, Corvallis, Ore.
Secretary—L. Happold, Oregon Agr. College, Corvallis, Ore.

Stanford University Branch
Chairman—H. W. Lewis, Stanford University, Cal.
Secretary—A. L. Morgan, Stanford University, Cal.

Montana State College Branch
Chairman—Roy C. Flagen, Montana State College, Bozeman, Mont.
Secretary—J. A. Thaler, Montana State College, Bozeman, Mont.
Meetings—Third Friday of every month of the school year in the Electrical Bldg.

Colorado State Agricultural College
Chairman—R. C. Richards.
Secretary—W. A. Stallings, Colorado State Agricultural College, Fort Collins, Colo.

Throop College of Technology Branch
Chairman—J. Paul Youtz, Throop Dormitory, Pasadena, Cal.
Secretary—Clark E. Baker, Throop Dormitory, Pasadena, Cal.

State College of Washington Branch
Chairman — S. E. Stites, 301 Montgomery St., Pullman, Wash.
Secretary—E. W. Tollefson, Box 393, College Sta., Pullman, Wash.
Meetings—Bimonthly at Mechanics Art Bldg., Pullman, Wash.

CONTRACTOR-DEALER ASSOCIATIONS

National Association of Electrical Contractors and Dealers
Chairman—W. Creighton Peet.
Secretary — Harry C. Brown, 41 Martin Bldg., Utica, N. Y.
Executive Committeeman-at-Large — W. D. Kohlwey, California; Executive Committeeman—S. C. Jaggar, Portland.

British Columbia Ass'n Electrical Contractors and Dealers
President—C. H. E. Williams, 509 Richards St., Vancouver, B. C.
Secretary—R. B. W. Pirie, 406 Yorkshire Bldg., Vancouver, B. C.
Meetings—First Tuesday of each month.

California Ass'n of Electrical Contractors and Dealers
President—H. C. Reid, 507 Montgomery St., San Francisco.
Secretary—J. W. Redpath, Rialto Bldg., San Francisco.
Meetings—Monthly.
Convention—Del Monte, May 8-11.

Electrical Contractors and Dealers Ass'n of San Francisco
President—J. M. Carlson, 175 Jessie St., San Francisco.
Secretary—J. W. Asher, 601 Howard St., San Francisco.
Meetings — Saturday, 12:15; Hof Brau Cafe.

Southern California Electrical Contractors and Dealers
President—G. E. Arbogast, 724 So. Olive St., Los Angeles, Cal.
Secretary—J. E. Wilson, 425 Consolidated Realty Bldg., Los Angeles, Cal.
Meetings—Every Friday at 6:30 p. m. at the Pin Ton Cafe, 427 South Broadway.

Monterey Bay Electrical Contractors and Dealers
President—W. Cox, Santa Cruz.
Secretary—J. A. Noggle, Monterey.

Nevada Ass'n of Electrical Contractors and Dealers
President—F. V. McAvoy, 138 N. Center St., Reno.
Secretary—R. W. Shearer, 215 Sierra St., Reno.
Meetings—Twice a month, 15th and 30th.

Oregon Ass'n of Electrical Contractors and Dealers
President — A. S. Halls, 262 Stark St., Portland.
Secretary—J. Willis Oberender, 301-2 Dekum Bldg., Portland, Ore.
Meetings—Every Saturday, 1:30 p. m.—Secretary's office.

Portland Local Ass'n of Electrical Contractors and Dealers
President—J. H. Sroufe, Jaggar-Sroufe Co., Portland.
Treasurer — J. W. Oberender, 301 Dekum Bldg., Portland.
Meetings—Saturday, 3 p.m., at 301 Dekum Bldg.

Utah Society of Electrical Contractors and Dealers
President—J. V. Buckle, Buckle Electrical Co., 70 E. 1st St., Salt Lake City.
Secretary—E. H. Eardley, Eardley Bros. Co., 37 E. 1st St., Salt Lake City.
Meetings — Every Friday noon at Commercial Club.

Washington Ass'n of Electrical Contractors and Dealers
President — V. S. McKenny, NePage & McKenny Co., Armour Bldg., Seattle, Wash.
Secretary — H. D. Alleson, 404 Oriental Bldg., Seattle, Wash.
Meetings — Quarterly—second Thursdays of March, June, September and December.

JOBBERS' ASSOCIATIONS

Electrical Supply Jobbers Association
General Secretary — Franklin Overbagh, 411 So. Clinton St., Chicago, Ill.
Meetings—Semi-annual.

Pacific Coast Electrical Supply Jobbers
President—W. S. Berry, Western Electric Company, San Francisco.
Secretary — Albert H. Elliot, 544 Market St., San Francisco.
Meetings—Quarterly. Next Meeting: Del Monte, May 6-11.

Electrical Credit Ass'n of the Pacific Coast
President—C. L. Gilson, Gilson Electrical Supply Co., 304—12th St., Oakland, Cal.
Secretary — Albert H. Elliot, 544 Market St., San Francisco.
Meetings—Annually: San Francisco; May.

OF ELECTRICAL INTEREST

Nevada Section, N. E. L. A.
Chairman—Geo. A. Campbell, Reno, Nev.
Next Meeting—April 13th.

National Electric Light Association
President—J. W. Lieb, N. Y. Edison Co., New York City.
Executive Secretary—T. C. Martin, 33 W. 39th St., New York City.
Meetings—June.

Pacific Coast Section, N. E. L. A.
President—H. F. Jackson, Holbrook Bldg., San Francisco.
Secretary—A. H. Halloran, Crossley Bldg., San Francisco.
Meetings—Annually, in April.
Next Meeting—Del Monte, May 9-11, 1918.

Portland Section, N. E. L. A.
Chairman—C. L. Wernicke, care Westinghouse Elec. & Mfg. Co., Portland, Ore.
Secretary — R. J. Davidson, care Pacific Power & Light Co., Portland, Ore.

Illuminating Engineering Society
Meetings—First Tuesday each month.
President—G. H. Stickney.
Secretary—Clarence L. Law.
Western representative—Romaine Myers, Bacon Bldg., Oakland.

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New Mexico Electrical Association
President—M. R. Buchanan, Silver City, N. M.
Secretary—E. M. Haggerson, Silver City, N. M.
Meetings—Annually, in February.

Southwestern Electric and Gas Association
President—H. C. Morris.
Secretary — H. S. Cooper, 403 Slaughter Bldg., Dallas, Texas.
1918 Convention—April 15th and 16th, at Galveston, Texas. Headquarters, Galvez Hotel.

Northwest Electric Light and Power Ass'n
President—Guy W. Talbot, 1212 Spalding Bldg., Portland, Ore.
Secretary—Geo. L. Myers, 1212 Spalding Bldg., Portland, Ore.
Meetings—Convention held annually. Executive Committee, governing body of Association, meets upon call of its chairman.
Next convention will convene in Portland, September 11, 1918.

Los Angeles Jovian Electrical League
President—H. N. Sessions, San Fernando Bldg., Los Angeles.
Secretary—W. C. McWhinney, Southern California Edison Co.
Meetings — Every Wednesday, 12 m., at the American Cafe.
April 10th—Meeting called off for sale of Liberty Bonds.

San Francisco Electrical Development League
President—R. E. Fisher
Secretary — J. W. Redpath, Rialto Bldg., San Francisco.
Meetings—Every Wednesday, 12:10 p. m.; luncheon, Palace Hotel.
April 3d—Gen. C. A. Woodruff.
April 10th—Lieut. J. S. Dagger.

Electric Metermen's Association
President — J. E. Bridges, Westinghouse Electric & Manufacturing Company.
Secretary — A. E. Coney, Great Western Power Company, San Francisco.
Meetings—About every 50 days.

Alameda County Electrical Club
President—George Drew, Pacific States Electric Company, Oakland, Cal.
Secretary — George B. Furmiss, Pacific Gas & Electric Company, Oakland, Cal.

Synchronous Club
Secretary—C. A. Blair, Los Angeles.
April 4th—George Schneiderman—"Motion Picture Photography."

Telephone and Telegraph Society of the Pacific Coast—San Francisco Section
President—L. S. Hamm, Pacific Tel. & Tel. Co., San Francisco.
Secretary—Chas. H. Dobson, 835 Howard St., San Francisco.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS

National Officers
President—Charles T. Main, Engineering Society Bldg., New York City.
Secretary—Calvin W. Rice, Engineering Society Bldg., New York City.

San Francisco Section, A. S. M. E.
President—B. F. Raber, University of California, Berkeley.
Secretary—Chas. H. Delany, 445 Sutter St., San Francisco.
Meetings—Quarterly.
Thursday lunches have been arranged at the Engineers' Club, 57 Post St.

Los Angeles Section, A. S. M. E.
President—F. G. Pease, Mt. Wilson Solar Observatory, Pasadena, Cal.
Secretary—T. J. Royer, 200 Title Insurance Bldg., Los Angeles, Cal.
Meetings—Quarterly.

ENGINEERS' CLUBS

Oregon Society of Engineers
President — Orrin E. Stanley, Box 973, Portland, Ore.
Secretary—C. J. Hogue, Box 973, Portland, Ore.
Meetings—Annual: Feb. 4, 1918. Monthly: Third Thursday of each month.

The Engineers' Club of Seattle
President—J. F. Pinson, Seattle, Wash.
Secretary—E. J. Bartells, Northern Life Bldg., Seattle, Wash.
Meetings—Thursday noon at the club rooms at 410 Arctic Bldg. A buffet luncheon is served every day. A special welcome is extended to all engineers visiting the city.

Engineers' Club of San Francisco.
President — B. P. Legare, 58 Sutter St., San Francisco.
Secretary—J. R. Brownell, 525 Market St., San Francisco.
Annual meeting: October.
March 29th—Robert Lloyd—"Army Singing."

Idaho Society of Engineers
President — W. H. Gibson, Mountain Home, Idaho.
Secretary—Ira F. Shaffner, Boise.
Annual meeting: January.

Engineers' Club of Oakland
President—R. S. Chew, Oakland Chamber of Commerce, Oakland.

MISCELLANEOUS

American Ass'n for the Advancement of Science—Pacific Division
President—D. T. MacDougal, Director Desert Laboratory, Carnegie Institution, Tucson, Arizona.
Secretary (acting)—J. R. Douglas, 430 Library, University of California, Berkeley, Cal.
Meetings—Annual.

American Chemical Society—Oregon Section
Secretary—Norman C. Thorne.

Foreign Trade Club
President — W. H. Hammer, Monadnock Bldg.
Secretary — Wm. E. Hague, Monadnock Bldg.
Meetings—238 Merchants Exchange Bldg., San Francisco. Every Wednesday evening.
April 10th — Henri Grand—"Tahiti: Its Trade."

Pacific Coast Gas Association
President — John D. Kuster, care Pacific Gas & Electric Co., San Jose, Cal.
Secretary—Henry Bostwick, 445 Sutter St., San Francisco.
Meetings—Annual. Next convention—September, 1918, in Los Angeles.

Society for Promotion of Engineering Education
Secretary—F. L. Bishop, University of Pittsburg, Pittsburg, Pa.

HAPPENINGS IN THE INDUSTRY

Annual Meeting, Pacific Gas & Electric Company

An increase in Pacific Gas & Electric Company's gross revenue for 1917, as compared with the company's income for 1916, amounting to $1,197,883.33, or 6.43 per cent, is emphasized in the report of First Vice-president and General Manager John A. Britton, presented at the annual meeting of stockholders. Discussing the company's operations for 1917, Vice-president Britton says that the increase in gross revenues for the year reflects the efforts made to obtain new business upon already existing lines, thus minimizing capital expenditures.

The increase in gross revenues of the electric department, which was 54.9 per cent of the total business of the year, amounted to $759,752.76, a gain of 7.52 per cent over 1916.

The total gross income in 1917 was $19,813,380.94, divided as follows:

Electric	$10,859,785.28
Gas	7,771,058.33
Water	475,332.85
Railway	491,021.14
Steam	216,183.34
Total	$19,813,380.94

Analyzing last year's revenues, Vice-president Britton said:

"The gross rate obtained from electric service fell off from 1.94 cents in 1916 to 1.85 cents in 1917, due to the fact that most of the new business taken on was low-priced, being mainly industrial in character. The failing in revenue per electric consumer has been felt all over the United States."

After citing figures compiled by the Department of Agriculture on the subject of the decline in electric income, Vice-president Britton continues:

"It will be observed from these figures that the rates obtaining in the Pacific and Mountain states are lower than in any other portion of the United States, being one-half those of the New England states and about 80 per cent lower than in other parts of the country.

"Our revenue per consumer also reflects this condition, the average revenue in 1916 being $56.54, and in 1917, $55.87.

"The gain in consumers for the year in the electric department was 15,744, the total number of consumers of electricity at the end of the year being 194,374. Electric construction costs during the year, exclusive of charges for acquisition of Oro and South Yuba construction, were $853,041.58 net, or $61.20 per consumer obtained."

There was a loss last year as compared with 1916 of $847,925.47 in net operating revenue, the reason for which is found in operating expenses of all departments. Increased

Some of you are actually making money through war conditions—BUY A LIBERTY BOND

use of fuel oil constituted one of the largest items of expense during the year.

Summing up the matter, Vice-president Britton said:

"It will be seen that oil costs, coupled with water shortage, over which we had no control, are directly responsible for the entire increased costs."

The present board of directors was re-elected with the substitution of W. G. Henshaw for his business partner, Charles T. Rudolph.

Change in Sales Organization of Bryant Electric Company

The many friends of H. E. Sanderson will be pleased to learn of his appointment as Pacific Coast manager of the Bryant Electric Company, in full charge of its business on the Pacific Coast and in British Columbia, with headquarters in San Francisco. W. A. Stacy of the Chicago office has been appointed Western manager in charge of the Middle West district and F. V. Burton, formerly Eastern manager, is now general sales manager of the company.

Compilation of Hydro-electric Data in the West

The Pelton Water Wheel Company, acting for the Machinery Builders Society of New York City, is sending out a circular letter to fifty of the more prominent hydro-electric companies in the West to gather data for the Council of National Defense.

A copy of the letter follows. The co-operation of all power companies throughout the West is urged in this matter as it is one of the means by which conservation of fuel may be the better brought about.

"We have been requested by the committee of which Mr. H. B. Taylor, vice-president of the Wm. Cramp & Sons Ship & Engine Building Co., is chairman, to write various hydro-electric companies on the Pacific Coast for data along the lines herein outlined. This is for presentation to the Council of National Defense. Contributors to the information are assured that all data furnished will be handled ethically, and that no advantages will accrue to the committee or others, because of access to the information.

"Will you please consider this questionnaire and afford such detailed and general data as you may feel disposed, although the committee appreciates that considerable of the information must necessarily be approximate.

"A list of specific water powers of which you have knowledge, giving each by name and location, together with the following details:

"1. Whether the development represents new construction, reconstruction or additions, and the approximate amount of additional power which can be developed by each of these three methods; also the character of any reconstruction. The list should include all plants in which you believe it would be practicable to increase the power by rebuilding the water wheels so as to improve their efficiency.

"2. The nature of the use to which the present power of each development listed is now applied, with special reference to the essential industries and war service.

"3. Mention of the specific war service for which the additional power can be utilized when war demands in the locality are known.

"Your co-operation will be appreciated.

"Please reply in duplicate.

"Yours very truly,

"THE PELTON WATER WHEEL CO."

New Generator Started

Officials of the Puget Sound Traction, Light & Power Company, Seattle, announce that the big turbine generator, the installation of which has just been completed at the White River plant of the company, has been started. The station at Dieringer is now capable of producing 61,333 horsepower. With the completion of a unit at the Georgetown steam plant this summer, the company will be able to generate 154,000 horsepower to supply the field between Everett and Tacoma. Of this 114,000 horsepower will come from hydro-electric plants and the remainder from steam plants.

Street Lights on War Basis

An order has been issued by Mayor Hanson of Seattle, providing for the turning out of 40 per cent of the cluster lights in the city at night, leaving only those at the street corners burning. It is announced that the new plan will effect a saving of $30,000 and will release electrical energy needed in the industrial districts. This order will be followed by an appeal to the merchants in the city to retrench in the matter of electric signs and store window lights. At the same time Superintendent of Lighting J. D. Ross will conduct a campaign for inducing people to do away with the old-style carbon bulbs and use only tungsten, which give more light and consume much less current.

Power Permits in Oregon

One hundred and five permits to appropriate water, and eight permits to build reservoirs were issued by John H. Lewis, state engineer, during the first quarter of the year 1918. These permits included the irrigation of 27,723 acres, the development of 501 horsepower, and water supply for one municipality. The estimated cost of these projects totaled $423,390.

Colorado Power Company Stock

A new issue of $250,000 Colorado Power Company 7 per cent cumulative preferred stock is being offered. The proceeds of the issue are to be used to reimburse the company for additions and extensions to take care of the increasing business available. A part of the proceeds will be employed in building a new and modern steam station on the company's Sterling property.

Object to Power Rate Raise

The Yukon Gold Company and the Indiana Gold Dredging Company, the former operating in Yuba, Butte and Placer counties, and the latter on the Cosumnes river in Sacramento county, filed protests with the Railroad Commission recently against the granting of any raises in rates charged them for power by the Pacific Gas & Electric Company. The Yukon company also filed a protest against any raise in rates charged it by the Great Western Power Company.

Both mining companies claim to have contracts that were entered into with the power companies at a time when the cost of power was the essential element in determining whether or not dredging operations would be undertaken.

Southern Sierras Power Completes Purchase of Subsidiary Units

Authorization of the last of four deals by which the Southern Sierras Power Company extends its field of operations and absorbs other units of the Nevada-California Power Electric Corporation's system, of which the Southern Sierras Company is one, was granted by the Railroad Commission, when permission was given the Coachella Valley Ice and Electric Company to sell its properties.

The Coachella company's transmission lines extend from Banning, Riverside county, to El Centro, Imperial county, and Yuma, Arizona. The consummation of the deal authorized by the Commission brings the Coachella Valley Ice and Electric Company, the Bishop Light and Power Company, the Corona Gas and Electric Light Company, and the Rialto Light and Power Company under the ownership of one corporation, the Southern Sierras Company having previously purchased the properties of the other three concerns.

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LATEST IN EVERYTHING ELECTRICAL

(The efficient lighting of factories has come to be a true method of war service in its power to speed up production. The description of a new lighting unit is therefore a matter of considerable interest. Electric labor-saving devices and an electrically operated house pump which is designed for general water supply in homes not served by a city water service, are also included.—The Editor.)

A NEW INDUSTRIAL LIGHTING UNIT

A recently developed industrial lighting unit which satisfies the requirement of efficiency without blinding glare, is easily kept in order, is non-breakable and is the Industrolite, which is manufactured by the Luminous Unit Co., St. Louis. Each unit comprises, as shown in Fig. 1, two principal elements, both of which are formed from white porcelain enameled sheet steel. In Fig. 2 is indicated the relative arrangement of these two elements, and also how light rays are redirected by them. The reflector element is a pan-shaped stamping of relatively large diameter. The second element is the protector, which is a cone frustum. It also is formed from sheet steel. This protector cone is suspended as detailed in the illustration, by links, which also support the reflector unit from the sustaining socket above. The prinpal function of the protector cone is to protect the eyes of the worker from the direct glare of the dazzling tungsten filament. However, it also has another and a very important purpose in that it redirects, as shown in Fig. 2, certain of the light rays which it intercepts.

Fig. 1—The Industrolite assembled on a lamp socket

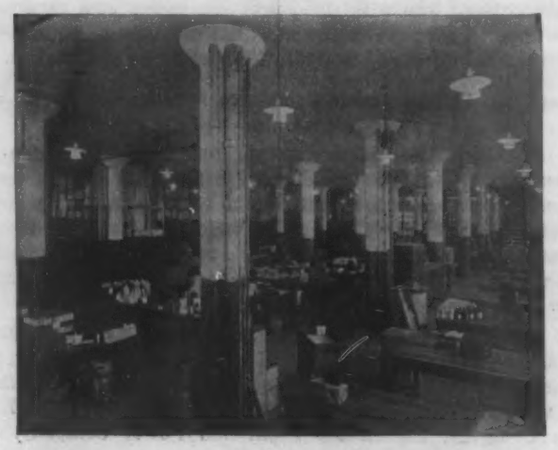
Practically every ray of light is utilized.

Fig. 2

Characteristic distribution of light.

Fig. 3

One feature of the Industrolite unit which is particularly worthy of notice is that it has no reflecting surface or projection which will collect dust readily. The porcelain will not crack or chip as do paint enamels. The occasional wiping with a damp cloth will restore to the reflecting surfaces their original luster and whiteness.



A chemical factory lighted by Industrolites. Ceiling height is 18 ft. Ninety 100-watt units are used

The fact that the installation cost of Industrolite is exceedingly low is an important factor in its favor. The Industrolite unit fits, that is, it may be hung from, any incandescent lamp socket. The labor cost is insignificant inasmuch as a boy, with a screwdriver as his only tool, can install one of the units in a few minutes.

Ventilation in the Industrolite unit is exceptionally effective. As shown in Fig. 2, the protector cone in reality provides a sort of a chimney which causes the cooling air currents as they rise around the lamp bulb to cool it. Furthermore, there is an open air space between the reflector metal and the neck of the lamp where the neck passes through the reflector.

PORTABLE ELECTRIC DRILLS AND GRINDERS

At this time, when working in metal and wood are synonymous with carrying on the war, any labor saving device which can be employed should be put to work at once. Portable electric tools which replace hand operation save time and labor and increase the output of a given working space. Particularly is this true of a portable electric drill such as that shown in the illustration. Less "elbow room" is required by a workman using one of these devices, and since he can drill a great many more holes per hour, he can replace a number of men who may be given to other tasks.

Tool-post grinder

This drill, which is manufactured by Gilfillan Brothers Smelting and Refining Company of Los Angeles, Cal., is equipped with gears to give two speeds. These are changed by means of a knob on the bottom of the gear case. The gears themselves are made of chrome nickel steel and run in grease. Ball bearings are used throughout. A ½-inch Standard chuck and a sturdy electric switch are provided. The speed range is 400 r.p.m. on low speed and 700 r.p.m on high speed.

The same concern also manufactures a tool post grinder adapted for use on lathes. An angle plate can be clamped around the tool post. There is a vertical adjustment of the grinder provided. This grinder is equipped with a Westinghouse ¼ horsepower motor running at 3400 r.p.m. It is provided with a 6-inch by ⅜-inch grinding wheel, an extension mandrel for internal grinding fitted with a 1½-inch by ⅜-inch wheel, a tooth rest for cutter grinding and an electric attachment plug with 7½ feet of cord.

That little child of yours—what would you not do to protect its future!—BUY A LIBERTY BOND

NEW ELECTRICALLY OPERATED HOUSE PUMP

A new small capacity electric-driven pump has been developed by The Crestline Mfg. Co., Crestline, Ohio, which is especially suited to replace the common water lift to pump rain water for soft water in residences. It can also be used for general water supply in homes when city water supply service is not available and the pump can be placed so the suction lift will not be over 25 feet.

A small capacity pump

The outfit is made in two capacities — Model "A" single cylinder with a capacity of 125 gallons per hour, and Model "B" with a capacity of 250 gallons per hour. Both will operate against a pressure of 50 pounds per square inch.

An automatic controller switch is connected with the discharge and is set to operate between pressure of 40 pounds maximum and 20 pounds minimum. It can be adjusted, however, to operate at any desired pressure.

The pump gears run in oil and this same oil is automatically carried to all the pump bearings. The only oiling necessary, therefore, is to place one quart of oil in the oil chamber on starting. This will be sufficient for one year's normal service.

Model "A" is fitted with a 1/6 horsepower, and Model "B" with a ¼ horsepower Robbins & Myers motor.

BOOKS AND BULLETINS

Elements of Fuel Oil and Steam Engineering

by Robert Sibley, editor of the Journal of Electricity and formerly professor of mechanical engineering, University of California, and Chas. H. Delany, steam power plant specialist, Pacific Gas & Electric Company; size, 6x9 in.; 320 pages; published by the Technical Publishing Company, San Francisco, and for sale by the Technical Book Shop, San Francisco. Price, $3.00.

With the present day emphasis on steam plant economies in the interest of fuel conservation, it is of the utmost importance for those handling fuel oil in power plants to be familiar with the principles of its efficient use.

A long felt want for a not too mathematical book which treats of the elements of steam engineering from the standpoint of the user of fuel oil is filled by this volume.

Although the subject matter is treated in a comprehensive and authoritative way, it is purposely presented in a form which is comprehensible to the man who has not a technical training, so that the book may prove of service as well in educating the man lower down in power plant operation. Fundamentals of steam engineering are taken up in the first part of the book, matters which should be at the fingers' ends of engineers as well as familiar to the men who are practically handling the oil. Details of furnace operation, heat balance, boiler testing, oil specifications and the like, make up the main portion of the work. Illustrative problems for the use of classes using the book as a text are appended, as well as the summary of the comprehensive investigation on crude petroleum undertaken by a committee of the California State Council of Defense. A discussion of the various state and federal aids that have been established to forward the study of efficient use of fuel oil and its conservation, is further added. The volume is well illustrated with views and charts which add both to the beauty of the work and its value to the reader.

As John A. Britton, vice-president and general manager of the Pacific Gas & Electric Company, one of the largest users of fuel oil in the electric field, says of the book in a letter to the authors:

"A work of this character has long been a necessity with engineers and it distinctly marks an era in the treatment of the subject, of which little is known. So far as I have been able to find time to read the book, I cannot but highly compliment the authors upon the marvelous extent of knowledge shown in the fundamental principles that govern our industry here in California, where oil must be used as fuel."

The book is intended for use by the central station man, the power plant operator, the mechanical engineer and the student.

Elements of Western Water Law (Revised)

by A. E. Chandler, president of the California State Water Commission, and president of the California Irrigation Board; size 6x9 in.; 165 pages; cloth binding. Published by the Technical Publishing Company, San Francisco, and for sale at the Technical Book Shop, Crossley Building, San Francisco. Price, $2.50.

The first edition of this book, which made its appearance in 1912, has for many months been completely exhausted. During the six years that have elapsed, the movement for new legislation providing a rational control of water rights has notably advanced, and the courts of last resort have either established new principles or strengthened the old. In this edition the text has been completely revised, so that the changes due to new legislation and judicial opinions may be duly emphasized.

The author of this work hardly needs further introduction, since his writings on water law in the columns of the Journal of Electricity have for many years been quoted as authority from many quarters. Suffice it to say, however, that he has had a long and varied engineering experience in private practice, in the United States Reclamation Service, and in the faculty of the University of California, and today as an irrigation and water right specialist he is contributing valuable service to the West as president of the California State Water Commission and president of the California Irrigation Board.

A workable knowledge of Western water law is an absolute necessity for any one who engages in the development of the great natural resources of the West.

This book steps down the long and wearisome legal phraseology of the courts in a manner that is pleasing to read and of great value to the engineer. For a direct discussion of the elements of Western water law no better treatise can be found.

National X-Ray Reflector Booklets

A series of attractive booklets designed to cover the uses of their fixtures in various types of buildings has been gotten out by the National X-Ray Reflector Company. These are appropriately bound and beautifully illustrated and form a useful addition to the selling literature on these fixtures. Their titles are: "Correct Lighting for Schools and Colleges," "The Eye Comfort Lighting System for Offices and Banks," "The Logical Light for the Hospital," "X-Ray Reflectors for Direct Lighting—Catalogue 20," "Eye Comfort Fixtures for Indirect Lighting—Catalogue E," and a folder entitled: "Eye Comfort," published to aid advocates of good lighting."

Wiremold Advertising

An 18-page bulletin with a cover suggestive of the Saturday Evening Post has been issued by the American Conduit Manufacturing Company in advertisement of Wiremold. The book contains a record of advertisements which have appeared and which are to appear in leading magazines in the near future, and is designed to show the dealer the extent to which the manufacturer is backing the campaign.

It is harder to be beaten than to win — BUY A LIBERTY BOND

NEW ELECTRICAL DEVELOPMENTS

(Proposed hydro-electric projects amounting to some eight million dollars in all are reported from the Pacific Central district. In the Northwest, Tacoma voted down the purchase of the street railway system. The installation of lighting systems seems to hold the center of interest in the Southwest, and new power developments in the Inter-mountain country.—The Editor.)

THE PACIFIC NORTHWEST

CHEHALIS, WASH.—County commissioners granted a franchise to the Central Light & Power Company for use of the county roads west of Chehalis.

SEATTLE, WASH.—An addition to the Georgetown power house of the Puget Sound Traction, Light & Power Company is to be constructed at once.

MONDOVI, WASH. — County commissioners have granted a franchise to the Washington Water Power Company to install electric lights here this spring.

CHEHALIS, WASH.—The question of granting to O. E. Anderson and others of Portland a franchise for the erection of a power plant here is to be voted on April 20.

TACOMA, WASH.—The city defeated the proposition of bonding in the sum of $5,000,000 to purchase the street railway system of the Tacoma Railway & Power Company.

SEATTLE, WASH.—The State of Washington has purchased the $350,000 in bonds voted at the last election for construction of the elevated street railway line to the shipyards, the bonds going at 4½ per cent.

TACOMA, WASH.—Louis H. Bean, manager of the Puget Sound Electric Railway, states that the company is ready to go ahead with the repairing of the short line bridge over the Puyallup River and resume its service as soon as possible.

PE ELL, WASH.—The Central Light & Manufacturing Company has been granted the right of way by the county commissioners to erect poles and string wires along the National Park Highway from Meskill to Walville.

PORTLAND, ORE. — Northwestern Electric Company, Pittock Building, has been granted permit to erect a foundation for a fuel building at the foot of Lincoln street, to cost $5000. Charles C. Moore & Co. are the engineers.

ASTORIA, ORE.—Bids will be received by the Port of Astoria Commission, up to April 23d, at 9:00 a. m., for the electric wiring in the bulk grain storage plant here. Certified check or draft for 10 per cent of the bid required.

MARSHFIELD, ORE.—The Umpqua Light & Power Co., which has taken over the Gardiner Light & Power Co., is preparing for installation of a new 125 horsepower steam engine in place of the 40 horsepower gasoline engine, and is making preliminary arrangements for placing a power line across the Umpqua River at Reedsport.

SEATTLE, WASH.—Authorization is to be asked of the federal government for the sale of $6,640,000 of Seattle securities, in a resolution introduced in the city council. Included in this issue will be $5,000,000 of lighting utility bonds for the construction of a completed hydro-electric plant, transmission line and substation, $350,000 in bonds authorized for construction of an elevated electric railway along the water front, and other small issues.

PORTLAND, ORE.—Members of the commission went to Weston recently for the purpose of hearing an application of citizens for an extension of the Utah Light & Power Company service lines to that place so that they could secure electricity for lighting and power purposes. At the present time it is without electricity. A five-mile extension to the Utah Light & Power Company's line will be necessary to accomplish this.

PACIFIC CENTRAL DISTRICT

SAN FRANCISCO, CAL.—Improved Electric Company has moved from 510 Sheldon building to 424 Geary street.

OXNARD, CAL. — Matilija Hot Springs resort has been leased and plans have been laid for extensive improvements, one of which will be the installation of a hydro-electric plant.

SAN FRANCISCO, CAL. — The Western States Gas & Electric Company has secured a five-year renewal contract covering the electrical requirements of the Pacific Sanitary Manufacturing Company of Richmond, Cal.

SAN FRANCISCO, CAL. — A resolution declaring that the public interest demands the acquisition by the city of the United Railroads' system and prescribing a method of ascertaining the value of the property, was passed by the Board of Supervisors.

OROVILLE, CAL.—That the Great Western Power Company is ready to proceed with the construction of its $6,000,000 Oroville plant the moment that it can be assured of government support in financing the project, was the statement made here by an official of the company. Further details have also been given as to construction plans.

SAN FRANCISCO, CAL.—Courses of instruction in the various phases of the work of the concern have been inaugurated by the Pacific Gas & Electric Company for its 1000 employees. Under the direction of the head of each department, lectures will be given in such subjects as gas engineering, electrical engineering, finance and accounting.

SAN FRANCISCO, CAL. — Application has been filed with the Railroad Commission by the Sierra & San Francisco Power Company for authority to issue $1,000,000 in bonds, the proceeds to be used for the construction of an additional hydro-electric plant on the middle fork of the Stanislaus River, the construction of storage reservoirs on the middle or the south fork of that river, building additional flumes, ditches, etc.

OAKDALE, CAL.—The Oakdale irrigation district now has an irrigation system valued at $2,677,000, according to the annual report. The district now has the system in shape for running of water, but with the frequent rains there has been no demand for irrigation and it may be another month before any call is made for service. In the meantime the Sierra and San Francisco Power Company is rehabilitating its plant at Knights Ferry, and the irrigation water will be used to manufacture power.

VALLEJO, CAL.—An electric lighting and power system capable of serving a city four times the size of Vallejo will be installed by the Vallejo Electric Light & Power Company, according to the officials of the company. The immediate improvements planned in connection with enlargement is the construction of a second pole line from South Vallejo to the power plant at the foot of Kentucky street, the installation of new and larger transformers and the addition of much new electrical equipment at the Kentucky street station. Application has already been made by the company to install a system of poles throughout the city.

PLACERVILLE, CAL.—George E. Loughland, superintendent of construction of the $1,000,000 project which the Western States Gas & Electric Company is developing in the

Why leave it for the next generation to win a second war? — BUY A LIBERTY BOND

summit of the Sierra Nevada Mountains, in El Dorado, Alpine and Amador counties, said that work would be begun this year as soon as possible. The company proposes to develop 8000 acre feet of water for power purposes at Twin Lakes, which will be obtained by the installation of a big dam. Considerable work on this project was done last year in work at Desolation Valley. The corporation intends to appropriate about 20,000 acre feet of water by their improvements, and the officials estimate this will develop about 40,000 horsepower. It is planned to construct a large power house on the American River, 14 miles from this city, to supplement the power house now in operation near Placerville.

THE PACIFIC SOUTHWEST

PHOENIX, ARIZ.—Plans are now under way for the reconstruction of the power house at the state hospital for the insane, and actual construction will begin at once.

SANTA FE, N. M. — The Columbus Electric Light & Power Company has purchased new equipment, which will be installed in the new building to be erected for the purpose.

LONG BEACH, CAL.—Work has begun on the erection of a new substation at East Wilmington Junction for the Long Beach, San Pedro and Los Angeles-San Pedro lines of the Pacific Electric Company.

SANTA ANA, CAL.—A petition has been filed with the city council by property owners on Lincoln street, north of Seventeenth, asking that lights be installed. A committee was appointed to investigate.

MANHATTAN BEACH, CAL.—The board of trustees has awarded a contract for reinforced concrete lighting posts and appurtenances to be installed on a portion of Highland Avenue, to O. Alvord Nichols, on his bid of $108.50 each.

CLOVIS, N. M.—Mountain States Telephone & Telegraph Company has promised to put in a modern exchange at Clovis at an expense of $50,000, as soon as the city has granted it a new franchise. The city council has announced its willingness to give the franchise.

LOS ANGELES, CAL.—The sum of $79,000 has been provided for the building of distribution lines for the city's Aqueduct hydro-electric power to all parts of the harbor section. Of this amount $34,000 will be used to extend the power lines of Fish Harbor on Terminal Island.

AZUSA, CAL.—Work will be commenced in a very short time to provide the big government school at Arcadia with electric power and light, gas and electric transportation. The Southern California Edison Company will supply power and is planning to bring new lines to Santa Anita rancho.

SAN DIEGO, CAL.—Improvements to be made at North Island include the building of a standard gage railroad running from the North Island bridge-head along the southerly side of the proposed paved boulevard. The sum of $24,000 has been appropriated for the construction of the railroad. Later it is to be electrified.

LOS ANGELES, CAL. — The contract for ornamental lighting of Broadway, between the tunnel and Tenth street, has been awarded by the board of public works to the Keystone Iron Works. The total cost of the improvement will be $65.985. The new posts will be 27 feet high, each equipped with two inverted arc lights.

LOS ANGELES, CAL.—It is stated that the fuel administrator will make a formal request that the city employ the $1,877,000 left in the power distribution bond fund to build additional hydro-electric power houses. One of these is said to be in San Francisquito Canyon, another is to be located at the foot of the Cascades, in the upper San Fernando Valley, and a third in Franklin Canyon, Hollywood.

LOS ANGELES, CAL.—Plans and specifications for competitive bids for ornamental lighting of more than 50 miles of Los Angeles streets have been approved by the board of public works and forwarded to the council for the passage of ordinances. A resolution has also been submitted to the council for supplying of Aqueduct power for ornamental lighting of Broadway from California to Tenth street. The municipal power bureau will be awarded this contract, as there were no bids submitted when called for by the board. The contract amounts to more than $30,000, as the globes and other equipment for the elaborate lighting scheme on Broadway will be included.

THE INTER-MOUNTAIN DISTRICT

KENTERVILLE, IDAHO — The Kenterville Telephone Co. has been incorporated here.

WINNEMUCCA, NEV.—H. H. Alexander who has a ranch north of Jungo, plans to pipe water from the mountains and to install an electric plant, utilizing the water for power.

MONTROSE, COLO.—The ordinance granting the Western Colorado Power Company a new 20-year franchise to operate in Montrose has passed its first reading in the council.

BOISE, IDAHO—No definite result has been reached by the city council regarding a new lighting contract for the city. A full investigation of the lights and cost will be entered into before a contract is signed.

RONAN, MONT.—Negotiations are under way between the council and the Mission Range Power Company of Polsen for an extension of its transmission lines to Ronan, a distance of about 14 miles, to furnish electric service here.

HARLEM, MONT.—The contract for the installation of the new ornamental lighting system in Harlem has been awarded to the Electric Construction Company of St. Paul, Minn., at $4,550.

COLUMBUS, N. M.—The Columbus Electric Light & Power Company, it is reported, contemplates the construction of an electric light and power plant to supply electricity in Columbus and Camp Furlong. The cost of the proposed plant is estimated at about $30,000.

SALT LAKE, UTAH—A delegation of property owners has presented a petition to the county commission asking that the county lighting system be extended to Draper and Riverton. The matter will be referred to the county electrical engineer for investigation and estimate of cost.

GRANGEVILLLE, IDAHO—Work is under way on the construction of a large dam on Clearwater River, eight miles from Grangeville, which when completed will double the output of the present plant. The dam is in circular form, 400 feet long and 20 feet high, and, it is estimated, will develop about 1600 horsepower.

VERNAL, UTAH—Application has been filed with the state engineer by Charles B. Bartlett of Vernal for the use of 40 second feet of water on Whiterocks Creek in Uintah county. The plans provide for a development of 950 horsepower to be distributed in and near Lapoint. The power will be developed through three 6 foot wheels under a 286 foot head.

GOLDFIELD, NEV.—The Nevada Valleys Power Company has consummated a deal with the Beowawe Electric Light Company by which the ownership of the plant at Beowawe passes to the former company, which owns and operates the plant at Battle Mountain. The plant will be shipped to Battle Mountain and rebuilt as an addition to the plant now there.

LEWISTON, IDAHO—R. S. Rice, president of the Union Copper Mining & Smelting Company, which company has been presenting the project of developing a hydro-electric power plant on the Salmon river, announces that it has been financed and will develop 62,000 horsepower. The chief object is to erect an electrolytic smelter for reduction of copper ore near Horse Show Bend.

Ad-itorial Comment

(A noteworthy feature of the advertising section in this issue is a new departure, "Ready Reference for Western Buyers." This is made up of cards from jobbers and manufacturers located in Pacific Coast cities. Such listing is indicative of the recognized fact that advertising is a great necessity at the present time, even when service facilities are being employed for governmental purposes. The firms advertising now have prevision of after-the-war business and are making proper provision to receive their due share. —The Aditor.)

Landers, Frary & Clark pictures the various Universal heating devices which are good sellers for gift purposes.

Electric Service Auto Company, a new advertiser in these columns, announces a universal fuse and circuit tester.

American Vulcanized Fibre Company recommends the use of "Vulcot" for electrical insulation.

Wells-Morris Manufacturing Company advertises a new starting switch for motors up to 5 horsepower.

Federal Sign System (Electric) states the latest attitude of the Administration in encouraging the use of electric signs.

The Robbins & Myers Company employes a striking cut-out to illustrate the strength and rigidity of the R. & M. fan.

Hurley Machine Company again advertises the Thor washing machine as an efficient labor-saving device in the home.

Benjamin Electric Manufacturing Company calls attention to the day-load building ability of the Benjamin two-way plug.

Westinghouse Lamp Company invites contributions to its series of "How I Did It" stories.

Edison Storage Battery Supply Co. emphasizes what the Edison storage battery is accomplishing as an off peak load builder.

Hotpoint Division, Edison Electric Appliance Company, displays the features of the Hotpoint Iron which make it easy to sell.

The Electric Storage Battery Company tells of the advantages of electric industrial trucks equipped with "Ironclad-Exide" cells.

Moloney Electric Company cites a 5000 kva. water cooled type of transformer as one of thousands giving efficient and reliable service.

Sprague Electric Company advertises wiring supplies for every requirement, particular emphasis being placed on BX flexible armored cable.

Pacific Electric Manufacturing Company has issued a valuable new series of bulletins on high-tension switching practice, which will be sent to interested parties.

Western Electric Company reproduces an effective advertisement of its portable sewing machine, which is helping dealers to sell to housewives throughout the country.

The American Conduit & Manufacturing Company features its campaign for introducing Wiremold into general use and shows how the contractor can benefit therefrom.

Hubbard & Company gives detailed lists of pole line hardware and Peirce specialties carried in stock by the Pacific States Electric Company.

Crouse-Hinds Company features the ZY condulet as "the last word in small motor switches."

Garland-Affolter Engineering Company features Howell polyphase motors and Peerless fans.

Jeffery-DeWitt Company tells the reasons why the Jeffery-DeWitt suspension insulator puts an end to high tension line insulator troubles.

Habishaw Electric Cable Company presents an excerpt from its current advertising whereby it is educating the people in the electrical idea.

Allis-Chalmers Manufacturing Company illustrates a powerful electric hoist and calls attention to special features of design and construction.

Cutler-Hammer Manufacturing Company suggests the use of C-H rectangular magnets as a most efficient means for conserving man-power.

Condit Electrical Manufacturing Company offers to send engineers a valuable booklet on "The Control and Protection of Small Induction Motors."

Youngstown Sheet & Tube Company patriotically devotes its regular advertising space to an appeal for men to enroll as U. S. shipyard volunteers.

National Carbon Company, Inc., lays stress upon the fact that "National" electrodes have kept pace with electric furnace developments from the start.

Century Electric Company emphasizes the smooth-oscillating feature of Century fans at all speeds, due to the ball-bearing motor support.

The Locke Insulator Manufacturing Company advises of local stocks at convenient points in the warehouses of the Pacific States Electric Company.

Baker-Joslyn Company shows how Macomb insulators conform with the recommendations of the engineering committee, Pacific Coast Section, N. E. L. A. Attention is also directed to the ease of handling and economy of storing Duraduct packages.

Westinghouse Electric & Manufacturing Company uses the Denver installation of Westinghouse voltage regulators to exemplify their ability to reduce costs of line construction. It also advises that the selection of a condenser be based upon a study of individual plant conditions.

General Electric Company advises the use of G. E. porcelain sockets for exposed installations. Special emphasis is placed on the sales help accorded to dealers by the "1918 G. E. Fan Cyclone." A picture of oil circuit breakers in operation after a severe snowstorm shows their fitness for outdoor substation use. An excellent view is also given of the 60,000 kva. Volta plant of the Montana Power Company, which is equipped with G. E. water wheel driven generators. Another page is devoted to telling of educational advertising regarding the dependability and economy of Edison Mazda lamps.